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ORIGINAL ARTICLES

LIVING ORTHODONTIC APPLIANCES*

BY ALFRED PAUL ROGERS, D.D.S., A.M., BOSTON, MASS.

IT IS strange that some of the fundamental aspects of orthodontia have been so long in coming to the surface, or having come are so long in being recognized. The supposed inscrutable nature of some of our problems seems now to be assuming somewhat the nature of an illusion. It would appear that certain of our methods of practice have been based upon the illusory nature of our concepts and are being practiced solely because of our lack of knowledge or that persistent habit of nature which holds a man to a groove in the performance of his daily task. I entertain scant sympathy for the one who holds to old methods simply because they are old, shunning the new because they are new. Minds typical of this attitude are not apt to add much that is destined to live and give new life to the evolutionary processes that are essential to our professional growth. Fresh problems and new developments in relation to practice are continually arriving, and new acceptances and fresh refusals of old ideas and methods are alone to be taken as indicative of the direction and scope of progress. This re-evaluation and acceptance of new ideas is bound to occur in any science that is normally progressive. Even though we point with pride to the events of the last quarter century, we should not do so with overmuch enthusiasm. It is true, of course, that much effort has been made and that many lines of investigation have been followed, but many of these well-meant efforts have, after their first effulgence, died away like the red flare of the trainman, changing not in the least the essential practical operations in the orthodontic field.

The true value of research or the observational methods, which are in more common use among us, is not always to be found in the conclusions arrived at by the research worker or the patient observer, but rather in the

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manner and degree in which mankind benefits from the discovery or observation. Thus it will be observed that the understanding and subsequent application of principles by men who are in daily contact with the long file of humanity is the important consideration overtopping all. Dr. Francis W. Peabody wrote shortly before his death: "I believe that the primary function of a department of medicine is to teach students those things that will enable them to practice the best contemporary medicine and will give them a foundation on which to superimpose the advances that will come during their professional life. They must be stimulated to keep abreast of its growth."[1]

We as a profession understand something of evolutionary processes. It is natural for us to think of our professional growth in terms suggested by our knowledge in this direction. We know that in order to be of any evolutionary value, variations must be inherited. This is true when considering our professional growth. In order to be of evolutionary value, ideas and practices that are found to be endowed with the elements of survival must be worked into the fabric of our professional thought. As a profession, therefore, we shall be wise if we consciously emulate natural processes and differentiate between heritable variations and those fluctuations which are not heritable and be considerate of the manner in which we build for the future. It is scarcely possible for us to predict the general course or the final outcome of some of our adoptions, owing to the fact that processes of development often repeat themselves again and again with slight variations. But just as one theme may form the groundwork of a great symphony, we may notice that one theme underlies orthodontic procedure: namely, the balance of functional elements. The elements, strangely enough, are largely under the control of the patient and cannot be sustained unless harmonious relations exist with the elimination of interferences or discords affecting the general theme of harmonious and balanced action. Surely these considerations should weigh heavily with anyone attempting to forecast the normal evolutionary development and in a measure point out to him, at least vaguely, the necessity of adopting as fully as possible those methods which tend to eliminate interferences and at the same time encourage the development of the main theme, harmony of function and tonicity of the elements under our control. It is quite true that the possibilities of mechanical apparatus may be imagined or predicted because they are definitely limited in action, but the possibilities of the "living orthodontic appliances" may as yet only be imagined and, although the light is beginning to brighten, their possibilities must at the present time be considered unpredictable because of their hidden potentialities which not one of us is able even correctly to guess in respect to a given individual. We have, however, proceeded far enough to recognize these possibilities and have accumulated evidence sufficient to convince even the most skeptical that we are entering upon a newer phase of orthodontics which promises to enrich our scientific achievements and reflect greater credit upon our professional accomplishments. It is because of considerations of this nature that we are now to consider a logical scheme seeming to promise a more enlightened and harmonious method of procedure. It is hoped that it

may lift into place an idea that will add to the solidarity of the structure being reared by our profession.

We are then about to enter into a discussion of certain fundamental physical properties which we believe have not received the full force of the constructive thought of the profession. It is extraordinary how little most of us have given heed to the possibilities of the living organism upon which our interests are being focused. There exists in every organism a system of actions and reactions which tends under the proper environment to develop the functional processes of each organ, and this is the basis of my belief, that these physical properties may be understood and arrayed in such a way that they ultimately may be intelligently employed in the process of recovery of normal function in that part of the human organism to which our attention is so assiduously given.

And now I have stated the gist of all that we are to talk about and to help decide whether or not there is any place for these ideas in the modern conception of our work. We should be lacking in honesty were we unwilling to face conditions and learn, first by thought and then by action, whether or not we are able to make intelligent use of such processes of nature as are understandable in our present state of knowledge or applicable if their fundamentals are understood. It might, I suppose, be profitable at this point if we should go back to the early days when these thoughts first began to take root and trace them along in their development, and show you by example just how far these first conceptions have developed into realities. As many of you, especially among the older members, may recall, our first conceptions were those of mechanics. By this I mean applied mechanics. We were taught at first that all deformities in which the teeth and jaws were concerned must be corrected and maintained solely by the use of certain forms of mechanical apparatus. It is true we were taught the true nature of bone, we were aware of its plasticity, for without this awareness the application of mechanical forces could in nowise be expected to help us reach the goal of our endeavor. But we soon learned that by the use of these mechanical forces alone we were enabled only partially to attain the wished-for results. There were many phases of development which we were unable to secure, and many of our results were lost after long and tiresome efforts at retention of mechanical nature. The recurrence of serious malocclusion soon after the removal of retentive apparatus amounted oftentimes to a mental attitude of discouragement. Many and obscure were the causes! It was under such a mental stimulus that the idea of function, thought of in a practical sense, appeared as a possible means of escape, at least from some of the causes of failure. And after all, is not the establishment of function fundamental in the treatment of most disorders? And so during the course of years the value of this idea became enhanced as one experience after another showed in little ways, in different directions, how increased functions might be expected to aid us, not only in the correction but in the continued maintenance of more perfect form. The question might be asked, what agencies are to be employed in order best to bring about satisfactory function in a given case of malocclusion? In

answering such a question, the operator must shift his attention momentarily from his historical teaching of mechanical application and ask himself what other agencies lay at hand to be developed as allies in the effort toward normalcy. It seemed that if this notion had truth within it, we ought surely to be able to discover some simple condition which might be benefited by an effort made toward the development of normal action, which of course meant coordinated muscular action. The search for such opportunities soon revealed slight cases of distoclusion, and it was found that occasionally some of these distoclusion cases became greatly improved when the dental apparatus had been induced to function with greater activity and precision. In some of those cases where a response was not satisfactory it was learned that by the removal of certain interferences, such as might be found in cusp relationships or in conspicuous maluse of one or more groups of muscles, still greater improvements were possible. It may therefore be readily understood that the operator whose mind accepts such theories must secure as an ally the mental apparatus of the individual under his attention, and induce him to bring into play certain groups of voluntary muscles which might be brought under subjection and trained to perform their useful function in the establishment and maintenance of a more nearly correct dental apparatus.

Now that we have revealed the instruments with which we are to deal, it might be wise to make a brief study of such instruments that we may understand their possibilities to the end that we learn to make extensive and beneficent use of their natural functions. Hill[2] tells us that "muscles are machines in many respects like those which we employ to do our work, and that the most obvious advantage is that they need no looking after." Considered as orthodontic appliances, they do not have to be constructed or applied. They are already in relatively correct position. They produce no ill effects upon the special dental organs when their employment is rightly understood. They do not need to be removed for adjustment or for cleansing, and, most significant of all, they improve in efficiency of performance following their intelligent use and, further, their usefulness is enhanced because of the fact that they actually stimulate tissue growth—the parts to which they are attached becoming more thoroughly under the control of the will. They are enormously strong and do not break at inopportune times. They move slowly, but are capable of exerting tremendous force. They may, of course, be injured by extreme strain, but they have the quality of self-reorganization. Now what may we say regarding the student's attitude concerning these valuable adjuncts to practice? Dr. Francis W. Peabody, in speaking of a student's attitude toward his work, says:

"He is, first of all, absorbed by an interest in the problem and then seeks the type of tools necessary to solve it. This is the intellectual, rather than the technical, method of approach."[1] Herein lies a valuable message for us, one pointing out the value of a careful selection of the "means whereby" our results are to be accomplished. It has already been declared that the bony tissue with which we are concerned is known to be of a plastic nature. It must also be remembered that when the parts of the apparatus are adjusted into a position of mechanical advantage it is possible to encourage further

growth and development by the use of these same pliant and reliable forces. It is not a strange idea when we remember that the monumental works of mankind, his building of bridges, his erection of lofty monuments, his wonderful achievements in the field of art—in fact, "the very maintenance of life itself is due to the action of little cells stimulated chemo-electrically (bunched together in little colonies), each cell being an individual soldier, each taking his proper place in the company of his associates, in the brains, spinal cord, or muscle fibers, all hidden away safely within the organism itself, communicating with each other in all directions, transmitting messages from without, and within, sending their multitudinous messages to the accompanying muscles along the nerve fibers which are indeed part of them. Each a separate living thing, dwelling in close continuity one with the other."[2]

Let us for a moment consider the nature of muscle itself, and in so doing become better acquainted with these agencies which are to be at our command. But before doing so let us remind ourselves for better emphasis that we have for years handicapped ourselves by trying to gain and maintain results solely through our mechanical efforts instead of pointing the way to personal self-improvement by the patient, ignoring physiologic forces which work under the direction of the mind in stimulating functional activity in the various organs which are essential to our complete success. We have failed to employ wisely these useful instrumentalities, ofttimes we have allowed ourselves to become baffled by the weakness of unused, or the strength of improperly used forces of the soft tissues of the face. If we turn to the textbooks of anatomy and physiology, we find some interesting chapters on myology and the physiology of muscular tissue. When considering these we cannot fail to be impressed with a greater interest and a broader understanding of a marvelous functional system awaiting development—one capable of serving us as an ally instead of an enemy. We learn that the movement of various parts and organs of the body is brought about by a special histologic structure, and possesses the special function of contracting in length under the influence of a proper stimulus. Our study is based solely upon the small group of skeletal muscles whose structural arrangement and mechanical action are based upon a common plan and are to be understood as being chiefly masticatory and facial. The cells of which these skeletal muscles are composed are long, narrow, and striated. They differ somewhat from the structure of some other muscles of the body, and in differing in structure they differ in function. The principal difference is that the striated muscle is under direct control of the central nervous system. A typical skeletal muscle consists of a fleshy mass enveloped in a membranous fascia, and provided at its end attachments with tendinous connections to either the bone or cartilage, or to fascia and skin. Each one of these muscles is made up of a number of fasciculi, arranged in such a way as to give form corresponding to the function of that particular muscle. These bundles of small fibers are held together by a delicate connective tissue, continuous with the surrounding fascia which encloses the muscles. Each smaller bundle is composed of a number of narrow elongated muscle cells or fibers held together by a still more delicate

connective tissue. Thus it will be seen that muscles are highly organized even when considered in connection with muscular tissue alone, and that they are essentially organized as the agents of motor activity when nervous, vascular, and lymphatic systems are considered.

It is interesting for our purpose to note how generously each muscle is supplied with nerve tissue, which, after entering the substance of the muscle, separates into smaller branches until ultimately it terminates in small fibers in each muscle cell.

Now, we have seen that the muscles may be regarded as organs endowed with particular properties; that being supplied with nerve tissue they are designed for definite movement in response to some stimulus, and that there is every reason to believe that the purpose of nature was to effect coordination of action through the elaborate though delicate nerve supply. "Muscles are little self-contained engines, consuming fuel and liberating energy."[2]

Muscles in their physiologic condition require for their maintenance and their activity a very large amount of nutritive material, since they are in a measure heat-producing organs. There is a certain amount of breaking down and rebuilding, and thus the lymphatic system is found as intricate and complete as the other systems. The lymph capillaries relate to the muscle fibers as does the nerve tissue, and give off short transverse branches which immediately break off in the capillary network surrounding the muscle fibers. It will be seen that they are admirably constructed for the work of repair and waste. The nutritive material passes through the capillary wall into the lymph space through the sarcolemma where it comes into the living tissue. The waste products pass first into the lymph, then into the blood stream, whence they are carried away by the eliminating organs.

"Mechanisms they are, but filled with complex and ever-present effort and growth; material devices, but filled with function and adaptability; physical and chemical processes, bound up with a mysterious kind of intelligence and purpose; all of which is as wonderful in the beauty of its mechanism as it is mysterious for the problem of its ultimate end."[2]

The physiologist also tells us that the properties of the muscles are their irritability, contractility, elasticity and tonicity. It is not necessary at this time for us to study fully these properties, for we know their significance in a general way, but it should be interesting for us to make reference to the mode of muscle stimulation in order to complete our conception of what muscles are, what they are for and how they can best be kept in condition.

The stimuli are furnished by action of the nerve impulses transmitted by nerves from the central system to the muscles. Each muscle impulse is a normal physiologic stimulus, and is under direct control of the will. Muscle, culture, then, by its very nature is also mental culture, because it calls forth repeated efforts of the will, and the exercise of this function of the muscle is mutually beneficial to mind and muscle alike.

In considering the beneficial effects of exercise in general we may draw valuable inferences when considering its effects in a more local way. In general exercises the activities of the body are of both mind and body. The

means by which exercise brings about these beneficent effects are numerous but not always clear. One factor, of course, is the more rapid circulation bringing a larger flow of blood and lymph through the muscles. This in turn favors a more complete combustion of metabolic products, and removal of waste products, and a provision of a more abundant supply of nutritive material for the muscle to build upon. Following exercises the metabolic activity of the tissues appears to be diverted to repairing and building up the tissues. This is why exercise is so valuable a thing with the young, as it is indispensable for the adequate development of the skeletal muscles, the heart and the lungs and other structures of the body. It is not possible to explain just why functional activity brings about growth, and disuse is followed by atrophy, but our clinical experience reveals the unexplained fact, and we must not forget at this point that exercise is beneficial mainly in its ability to stimulate activity of the tissues resulting in greater functional efficiency.

"In biology to talk of function of an organ, the purpose of a reaction or adjustment, the individuality of an organism, coordination of its parts, the integration of its function, is perfectly good sense, based upon obvious and verifiable experimental facts. Throughout the realm of living nature we find an adaptation of means to end."[2]

We have now given a very general description of what muscles are, how they are constructed for the production of energy, and how the voluntary muscles are controlled through their nerve connections with the central nervous system; it is analogous to studying the composition of the metals we use for a general orthodontic work, learning something about their elasticity, spring recovery and melting points. We become conversant with these qualities because we wish to know how best to treat them, and what to expect of them under certain conditions and in certain situations where their operations are under the direction of our will. We are interested in forms, and the location and application of appliances as these qualities relate to their efficiency. We know, for instance, that a lingual wire is somewhat different in its action, and has a somewhat different function than would be expected of a labial wire, and the same analogy holds true with all other forms of appliances. Some are efficient for one purpose and some for another, but the final objective point of their use is always the objective point of harmony in relationship to the parts which they are supposed to influence. The same is true of the muscular system of the face and jaws. The various groups have locations, or occupy positions, of special advantage for the performance of their appointed tasks. They are efficient or inefficient according to their quality and response to the will of the patient. Tonicity in a muscle might be likened to the tonicity of a cold drawn wire used for special purposes. Therefore, it will be clearly understood that we need to acquaint ourselves with the forms, the locations and the special actions of the various groups of living orthodontic appliances which come under the general term muscle, as our mechanical appliances fall under the general term metal. When we consider a skull and examine it carefully, we find various eminences and bony ridges and roughened surfaces which mark the origin and insertion of many of these groups of living ortho-

dontic appliances. Names have been given to these various groups just as we have given names to our mechanical apparatus and in like manner the names often imply or describe their function. It is important, therefore, to be acquainted with these groups, their locations and their functions, and just as we require the finest qualities in the metals we use we also require the finest quality in these living tissues which after a time we come to consider not only as allies in our treatment but as fundamental in treatment and retention.

Before we go further, a word or two regarding the mechanics of muscles. We generally think of muscular action as a group-action because most muscles when they contract are either accompanied in the action, or opposed, by harmonious action of neighboring groups. But we may think of most muscles, however, in a mechanical sense, as units, the muscle fibers always constituting the elementary motor elements. In those muscles where the fibers run in a straight line from the origin to the insertion, a straight line drawn along the fibers will indicate its direction of pull. The masseter muscle is a very good example of this kind of action. In some portions of the body the muscle-pull is bent. Muscles of this nature are what might be called muscles of double formation, but the direction of the pull even in these muscles is in a straight line with the fibers. Their strength usually depends upon the number of fibers and in what is termed the physiologic cross-section, that is, a section that passes through all or nearly all the fibers.

Considering those muscles which may be thought of as "living orthodontic appliances," perhaps the group most universally useful is the masseter-temporal group. It is astonishing how frequently we find the strength of this group insufficient for the purposes of mastication. When it is found in this condition it is quite useless for developmental orthodontic appliances and must be reeducated.

Critics of this method of treatment have pointed out that frequently we find perfectly developed dental apparatus where the muscles are atonic and poorly developed, thus convincing themselves that the method of muscle culture in relation to orthodontics is a matter of pure fancy, with little behind it to justify its consideration as an adjunct to practice. Those who accept this position are men who in all probability have had insufficient experience in the treatment of malocclusion through the intelligent use of the pliant and efficient forces of the soft tissue surrounding the dental apparatus, forgetting that harmonious action of the muscle groups concerned is quite as important a factor as their increased strength. It is possible to show in a very considerable number of instances that actual development of bony tissue and increase in the size of the dental arches may be obtained through the intelligent treatment by means of the living orthodontic appliance.

Physiologists will tell you that "the influence of activity upon form and function of an organ is twofold. There is the first and immediate change brought about by the very act of functioning. For example, the shortening and thickening of skeletal muscles as they act; and that oft-repeated exercises or heightened exercises or special functions or repeated action of the functional stimuli which determines them produces, as we have said before, true form changes as a by-product."[3]

Without endeavoring to explain the mystery where perfect form may be found coincident with insufficient functioning, I can only suggest that the form, although appearing perfect, may yet be far below its normal development. We learn that "it is in the first period of automatic development through internal 'determining' factors that the 'developmental' functions in the strict sense, e.g., automatic growth, division and self-differentiation, are most clearly shown. In the second or 'functional' period the formative influence of function upon structure comes into play, and the development becomes largely a matter of 'functional adaptation' to functional requirements. All structure according to Roux is either functional or nonfunctional. The former includes all structure that is adapted to subserve some function. 'Such functional structures' are, for example, the composition of striated muscle fibers out of fibrillae and these out of muscle-prisms. Functional structure may be formed either in the first or the second development period, it may be either inherited or acquired, but it reaches its full differentiation only in the second period, that is, under the influence of function. Practically speaking, functional structure is directly dependent for its full development and for its continued conservation upon the exercise of the particular function which it serves. In the second period, but not in the first, increased use leads to hypertrophy of the functional structure, disuse to atrophy."[3]

In view of the above, therefore, let us continue a more or less incomplete consideration of the few groups of muscles most useful to us in our work.

MASSETER-TEMPORAL GROUP

It has been already suggested that we think of our living orthodontic appliances somewhat in similar terms as we do when we consider our mechanical apparatus. That is, each form of appliance is expected when under intelligent direction to produce certain changes in form. Here is more or less a diagrammatical representation of the important masseter-temporal group. It is a living orthodontic appliance of great efficiency and its function in this rôle is not only developmental in character but also retentive. With the use of this muscle under the proper circumstances and under skillful direction, it is possible to develop either the maxillary or mandibular arch. It is possible with this orthodontic appliance accompanied by a simple mechanism as an adjunct to assist in the correction of infraclusion occurring either in the anterior or distal portions of the dental arches. With this orthodontic appliance it is also possible to correct distoclusion and, furthermore, to act as a retentive measure preventing the recurrence of distoclusion. As a by-product in orthodontic treatment of this nature we find that there is produced a quality which is almost always lacking when treatment is undertaken purely by mechanical means, namely, the full efficiency of the function of mastication. I have been repeatedly reminded by parents, nurses and physicians that the ability to masticate food has become greatly enhanced, much to the benefit of the individual's health, where greater consumption and assimilation of food has been fundamental in the treatment of the individual. I am refraining at this time from entering into the particular details of the coordinate treatment

where muscle and metal are employed because of the fact that time will not permit, and also that these considerations have been placed within your reach on various occasions. My purpose in this paper is principally to bring before you these appliances of living tissue in a manner calculated to lead you to view them with central fixation of both eye and mind, that you may depart in a thinking attitude that may grow into a greater appreciation of the possibilities of this method of treatment and to dissipate the seeming inscrutable nature of some of our problems. You sometimes hear it said that only a very small proportion of malocclusion contains the etiologic factor of atonic muscles or muscles in malaction. The inference to be drawn from such a statement is that if there is truth in this method, it is applicable to comparatively few individual cases. From my experience I am in a position to warn you against hampering your usefulness by accepting such conclusions.

PTERYGOID GROUP

Next in importance to the masseter-temporal group might be placed the pterygoid group. It is astonishing that we have been so long in arriving at an appreciation of the functional importance of this group of muscles. It is true enough that we have realized vaguely that the principal function of this group of muscles is to adjust the mandible in its various functional movements, but we have not appreciated fully enough that it is possible to adjust the mandible in a relatively normal position. In distoclusion, for instance, we have not realized that the reason this group of muscles does not always adjust the mandible to its normal position is on account of certain interferences which the muscle has difficulty in overcoming. Under certain circumstances this group of muscles may be encouraged to overcome these handicaps unaided by mechanical apparatus, but in the vast majority of cases of this nature simple mechanical measures need to be employed as preliminary treatment, the proper method being, while removing one interference after another, to encourage these muscles to continuous effort in the direction of normal position. Thus they may be employed in the treatment of distoclusion, either of a bilateral or unilateral nature. Their natural tendency is to draw away from the interferences, the character of the interference determining the position of the mandible. For example, in a slightly narrowed maxillary arch where there are interferences on both sides of the arch the tendency is to allow the mandible to operate in a distal position, or if the main interference happens to be unilateral their pull becomes unequal and the mandible rotates, oftimes producing a unilateral position of the mandibular arch. For your benefit I must suggest one of the best ways to realize the function and possibility of these muscles is to study your individual mechanism. Each one within my hearing possesses a complete set of these "living orthodontic appliances"; it is possible for each one to learn much by the careful study of his own possessions. Perhaps no feature of this method of treatment has been more thoroughly misunderstood and misapplied than the exercise of this function when attempting to treat various forms of malocclusion by this method. I always entertain a little hesitancy in trying to illustrate, or direct specific

exercises, believing that the more proficient method is to lead men to understand the fundamental ideas relative to this form of rational orthodontics, because when the fundamentals are once understood the particular and special methods of operation gradually develop as a consequence.

There are, however, some things that might be said which may tend to limit useless or mistaken efforts. It should always be remembered, particularly in the treatment of distoclusion, that in each individual there are certain physiologic limits which should not be violated. The student of this method of orthodontics should make a careful study of each individual and ascertain the normal limits of action as nearly as it is possible to do so with our present knowledge. The limits of mandibular movement are dictated by the form of the condyloid path, and the individual characteristics of the mandibular ligaments, care being taken when directing exercises to avoid strain by encouraging efforts of an extreme nature. Then again, careful attention should be given to the study of points of interference, and when engaged in this study the student should bear in mind that the position of the special dental organs in reality constitutes the controlling factors of mandibular movement. When careful attention has been given to this phase of the treatment it is often surprising how readily the controlling forces of the mandible take advantage of a situation and respond to the conscious effort of the patient. Many cases of distoclusion will be found easily curable when as few as one or two points of interference have been removed. Students who have been successful in this work have repeatedly told me that they regard the search for and the removal of interferences of paramount importance. And my experience fully confirms this assertion.

Before passing on to another group of living orthodontic appliances, I would like to make it clear that development brought about by increased function needs no retention, but development brought about by mechanical means must be retained until the muscular function has been well developed.

TONGUE

Perhaps the group next in importance will be found in the tongue and its attached muscles. No orthodontist of experience is ignorant of this member's ability to bring about serious malocclusions when its habitual use departs from the normal. It was the recognition of certain occlusal defects brought about by the maluse of the tongue that prompted me to ask the question whether or not this member, giving evidence as it so often does of its ability to influence the form of the alveolar process, if the reverse might not also be true and that it also held a promise of aid in reestablishing normal conditions or, in fact, of being rendered capable of developmental ability. A few experiments soon revealed the fact that the tongue could indeed be considered an orthodontic appliance of real value, and gradually in my own experience it was found to lend itself quite readily to various forms of treatment. On other occasions I have referred to successful methods of tongue control, particularly in the correction of habit movements which seriously affected the harmony between the dental arches.

The last groups of orthodontic appliances which I am going to call to your attention at this time are the ribbon muscles and the orbicularis oris muscle groups. The ribbon muscles of the face and the orbicularis oris blend in such a way that they may be regarded as a unit when considering the improvement in the harmonious development of the face, supplementing the routine treatment undertaken in the correction of various malocclusions. When these groups of muscles have been brought to atonic condition, through conscious efforts on the part of the patient, they not only improve the general contour of the face but assist markedly in corrective treatment and retention.

I trust that you now have a picture in your minds of the living orthodontic instruments which it is possible to employ in the treatment and retention of various forms of malocclusion. The basic potentialities of these instruments are in reality to be found in the central nervous system and may be rendered valuable in proportion to your understanding and in your ability to direct the patient in conscious guidance and control.

I believe it proper to interest orthodontists in this physiologic aspect of our work and to encourage them to experiment on themselves, learning the processes which are ever active in their own bodies, leading them on to understand the fundamentals of the newer orthodontics. We must realize that there is no limit to the exploration of these important mechanisms and at the same time learn to appreciate the "wonder and the beauty and completeness" of the process when properly understood. I believe that those who undertake an unprejudiced study will not only gain for themselves a broader conception of orthodontia but should in the end become vastly more useful in their service to humanity. *The understanding of the normal processes of nature, coupled with an intelligent and cautious re-education of the abnormal individual, is the scientific basis upon which orthodontics should rest.*

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DISCUSSION

Dr. George W. Grieve, Toronto, Ont.—I would like very particularly to discuss this paper, and am sorry the hour is so late, because I feel that many here would like to have the opportunity which I have made haste to grasp for myself.

For a long time I have looked with a great deal of awe upon a number of men in the profession, including Dr. Rogers, and also Dr. Lourie, who has collaborated with him in this presentation, and while I may say a few things that are not quite in accord with them, it is not in the way of criticism, but in an effort to bring out some points more clearly.

Dr. Rogers did not enter into any detail at all, and he also asked his collaborators not to do so. I think that this is a mistake, because I feel that we do not get out of these papers all that we would if details were brought out more definitely.

One thing that struck me was that Dr. Rogers spoke of the main theme as being "harmony of function," and later said that "the establishment of function is fundamental." He said that muscles are machines, and when they are inefficient they must be educated. He speaks of them as "living orthodontic appliances."

Now, at one time I felt that with the wonderful pin appliance, skilfully handled, we could do almost anything which we desired in the placement of teeth, and I thought, to be perfectly honest, that these ideas of muscle exercises were probably more or less fads, and I did not give them the serious consideration which they deserved.

Later I discovered that I had many failures, notwithstanding the efficiency of the pin appliance, after years of labor endeavoring to perfect a technic whereby, if possible, we could assist nature to develop in our cases normal occlusion. Finally I realized, when so many cases fell down, that there was something lacking. I was giving one hundred per cent attention to the correction of the malocclusion, but very little to its cause.

I have now become very firmly convinced that one of the biggest causative factors of the malocclusion is inharmony of pressure between the muscles of the lips and the tongue, and that most of the cases which we are called upon to treat, including those with deep overbite, are the result of this inharmony of muscular pressure.

There are many persons with large oral fissures and the muscles of whose lips are so inert and flabby that there is developed more or less protrusion of both maxillary and mandibular teeth, even though they may be normal breathers. On the other hand are those with small oral fissures and tense muscles of the lips, whose teeth will be crowded as a result. There is a variation, also, in the size and strength of the tongue. Dr. Freil, of Dublin, has brought out this latter point as to variation in the strength of the muscles of different tongues. In a patient with a large oral fissure, inert muscles of the lips and a large tongue, we may find a great deal of spacing of the teeth and possibly excessive overbite.

Now then, as to the size of the tongue, and whether it can be controlled or not. I have seen persons with an extremely large tongue, a small oral fissure, and the muscles of the lips so tense that the teeth were actually tipped back into the mouth. I know, also, from looking for this sort of thing, that some of these individuals have normal dental arches where the pressure happens to be balanced.

I have one patient for whom I commenced treatment at nine years of age; that boy has had no appliances on for seven or eight years or more. He has beautiful dental arches, a tongue like an ox, but a small oral fissure and good firm muscles of the lips; there is balance there.

Dr. Rogers says it is possible with exercises to correct distoclusion. This may be true, in some minor cases, where the mandible is short, but in most cases of distoclusion the fault is a maxillary protrusion, and in this latter type it is necessary to carry the maxillary teeth back to their normal positions on the apical base. I believe, however, that it is absolutely necessary to obtain normal development of the associated muscles to assure post-maintenance of our cases after correction.

The Chairman tells me that time for discussion is very limited, for which I am extremely sorry, because I feel that this subject of muscle development is more important in our work than most orthodontists realize. I believe that if our cases are properly corrected, and normal function of the associated muscles restored, mechanical retaining appliances are necessary. I thank you. (Applause.)

Dr. Wm. J. Speers, Boston, Mass.—I regret that the hour is so late and that I have been allowed but one minute to discuss this paper.

It has been my good fortune to be associated with Dr. Rogers for the past year and one-half and I have been in a position to observe many of his results.

It probably will surprise him that I should appear on my feet at this time, but I cannot let the opportunity go by without expressing my appreciation to him for the wonderful work that he is doing. I feel that he has made a truly great contribution to practical orthodontia in the last ten years, as great as any man of whom I know in the profession.

I had conducted a general practice combining with it orthodontia for twenty-five years and had been in touch with Dr. Rogers but had had by doubts as regards the developments which could be obtained by his methods. These doubts have been dissipated in the last

year, when I have seen case after case in the office in which one lingual wire has been applied and a development of from one to four millimeters been produced in the opposing arch.

I thank Dr. Ketcham for the one minute but wish I might have had longer.

Dr. Martin Dewey, New York City.—I should like to ask two questions. I may be dumb, which I will admit. I may have misunderstood these gentlemen, but I want to know whether they believe in posterior occlusions or distal occlusions that the mandible occupies a posterior position.

Secondly, I want to know whether they believe the external pterygoid or any other muscle holds the mandible in a proper position.

Dr. A. H. Ketcham, Denver, Colo.—After hearing Dr. Rogers lecture for three days at the recent meeting of the Pacific Coast Society of Orthodontists in San Francisco, and then having the benefit of a visit with him at Carmel for a couple of days, I told him that orthodontists need a reference book written by him, with his muscle exercises explained in simple language, and illustrated generously.

He replied, "I will write such a book, if I can find time and have strength."

I think, if you urge him, he will carry through. (Applause.)

Dr. Rogers answering Dr. Grieve.—Doubtless we all have had experience with mouth conditions such as Dr. Grieve has described. The enlarged tongue is not necessarily indicative of strength. Much may be done for conditions of this nature through exercise which tends to strengthen the tongue and at the same time reduce it in size. We frequently meet with patients who have the ability to expand or contract this organ at will, and sometimes we notice patients who possess the habit of allowing the tongue to assume its largest dimension continuously. The muscular tissues of the tongue are not unlike the other voluntary muscular tissue, and may be brought under the control of the will. The problem of distoclusion which Dr. Grieve has referred to is one which is greatly alleviated by this form of treatment. It is rare to find a case which does not respond favorably, to a greater or less degree, when this form of treatment is intelligently applied. The same may be said in relation to mesioclusion.

Replying to Dr. Speers, I wish to say that I very much appreciate the very kind things he has to say, and of course—

Dr. Speers.—I wish I had been given half an hour instead of a minute. (Laughter.)

Dr. Rogers in reply to Dr. Dewey.—My opinion is that in the majority of such cases the mandible is in distal position. My reason for this opinion is that I have observed many cases of distoclusion develop without any great change in the maxillary arch other than the development of an interference. Such changes may be noticed occasionally in children who have suffered from prolonged diseases of childhood during the transitional period when an interference developed between the mandibular incisors and the maxillary incisors.

Such cases are readily corrected. My theory is that if the masseter-temporal muscles are strong enough during the transitional period that the distoclusion would be unlikely to develop.

The mandible is held in position by muscular action guided by the special dental organs. The teeth and their inclined planes dictate a position that the muscles controlling the mandible shall assume. This process is very clear in my experience.

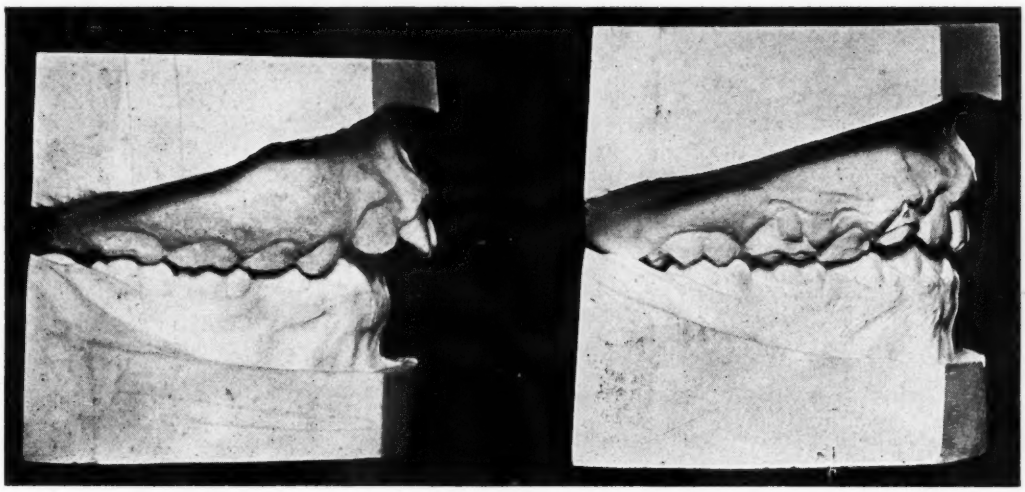
Dr. Dewey.—Did I understand you to say the pterygoid muscles place the mandible in distal position?

Dr. Rogers.—The pterygoid muscles are allowed to relax in some individuals so that the mandible does take a distal position. This is my belief. (Applause.)

CASE REPORT*

By Dr. Ralph E. Gove, Boston, Mass.

CASE 1.—A boy of nine. Neutroclusion with a marked protrusion of the maxillary incisors, and a flabby set of lip muscles. Treatment consisted of a junior pin and tube appliance on the maxilla for about ten months. The last two months the case was put on lip exercises. The muscles were built up in this way and supplied the necessary balance to hold the case. I think the success of exercises is largely due to the cooperation of child and parent. It is necessary to impress on them from time to time the importance of this treatment, and of keeping busy. We all know what a bad habit will do. A good habit will accomplish just as much in the right direction if we can once get it established.



Case 1

Case 2.—A girl of fifteen. Distoclusion. Maxilla narrow and crowded. Treatment: Two lingual arches with auxiliary loops for general development for two years. Then the upper lingual arch was removed and a pin and tube appliance on the canines with molar anchorage was used to develop the canine region apically. At about the end of the second year when interference had been removed, the case was put on temperomasseter exercises. At this time the masticating muscles were very weak. In about a year a natural almost neutroclusion was established, and a fine set of masticating muscles was developed. This case was treated without intermaxillary elastics, ligatures, or finger springs. If the mandibular anteriors had been elongated, I would have relieved this interference before attempting exercises. The case is now retained with a Hawley removable retainer on the maxilla only.

*Case report read in connection with Dr. Roger's paper given before the American Society of Orthodontists, May 1, 1928, at Buffalo, N. Y.

CASE 3.—A little girl three and a half years old. Mesioclusion. One of the few young cases demanding immediate treatment. Extreme overbite (8 m.m.) preventing proper development of the maxilla. Treatment consisted of a 0.028″ lingual wire *c* auxiliary loops on maxilla for general development and intermaxillary anchorage. On the mandible a pin and tube appliance for intermaxillary anchorage. Intermaxillary elastics were used for about a week, and then the case was put on temperomasseter exercises. The development of the maxilla was continued with the exercises. Second models show the case at the end of nine months, the overbite corrected and very nearly normal for the age of the child. Several times it was necessary to use one elastic over a day or two to keep the median line correct.

CASE REPORT*

BY DR. FRED R. BLUMENTHAL, BOSTON, MASS.

Fig. 1.—This first case is one of a simple type in which I merely want to illustrate the development of both arches with but a single appliance and with muscle exercises. The child was five and one-half years old, and the right hand model is at six and one-half years, just a year later.

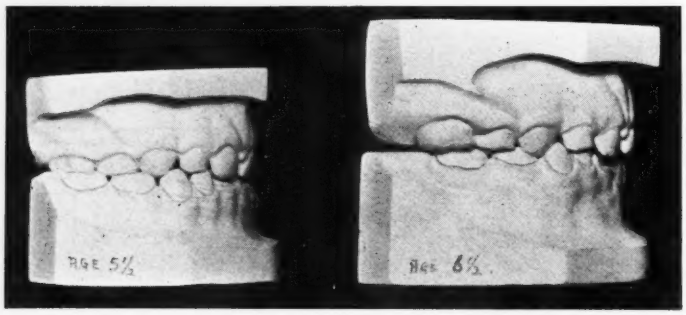


Fig. 1.

Fig. 2.—This shows the other side of the same child. An upper lingual appliance was inserted and active treatment of the superior maxilla was carried on for approximately six months. Two slight adjustments of the superior lingual appliance were made.

I believe today the same amount of treatment with the proper manipulation of the appliance could be done with not more than one readjustment of the appliance.

Fig. 3.—The child, after approximately six months of treatment, was placed on muscle exercises, and the second model shows the condition at the age of six and one-half years. No lower appliance whatever was used, yet there has been a marked development of the mandibular arch, approximately two millimeters.

*Case report read in connection with Dr. Roger's paper given before the American Society of Orthodontists, May 1, 1928, at Buffalo, N. Y.

The child has continued to develop with no further mechanical stimulation and today the teeth are in normal occlusion.

As previously stated the case was shown merely to illustrate the development of the mandibular arch through the stimulation of the maxillary arch.

Fig. 4.—This case, a child of eight years and six months, was started in September, 1922. An upper lingual appliance was inserted; maxillary arch developed, and the superior anterior teeth brought into proper position—no

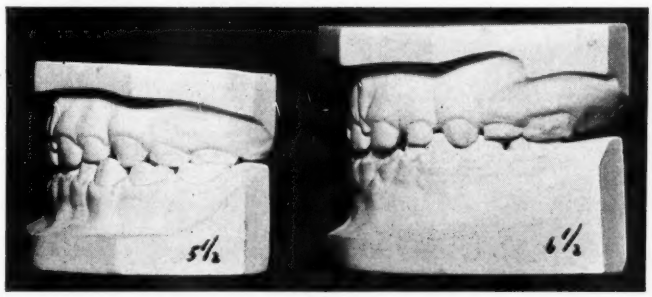


Fig. 2.

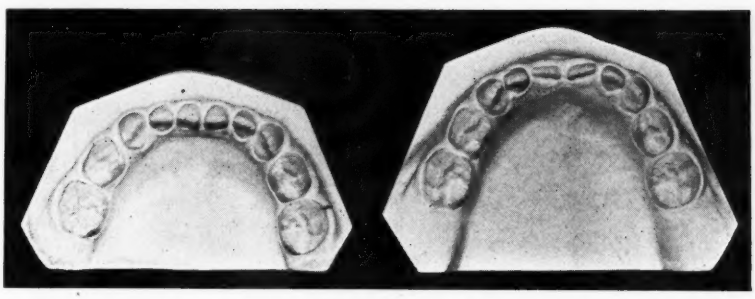


Fig. 3.

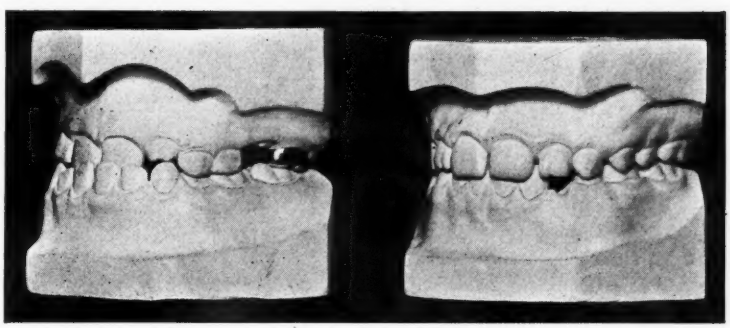


Fig. 4.

mandibular arch ever being used on the case. The time of active treatment with the appliance was approximately eight months. In June, 1923, the appliance was completely removed. Muscle exercise was carefully carried on and the second model merely shows progressive development.

Fig. 5.—This shows the present condition, April, 1928, approximately five years after appliance was removed, no mechanical retainer ever having been used.

Fig. 6.—This case is one with a tendency toward Class II upon which a simple junior pin and tube appliance was inserted on the maxillary arch. The age of the patient was seven and one-half years and the case started December, 1922.

Fig. 7.—Lateral development was obtained, interferences removed, and the child placed on pterygoid muscle exercises; a delicate lingual appliance

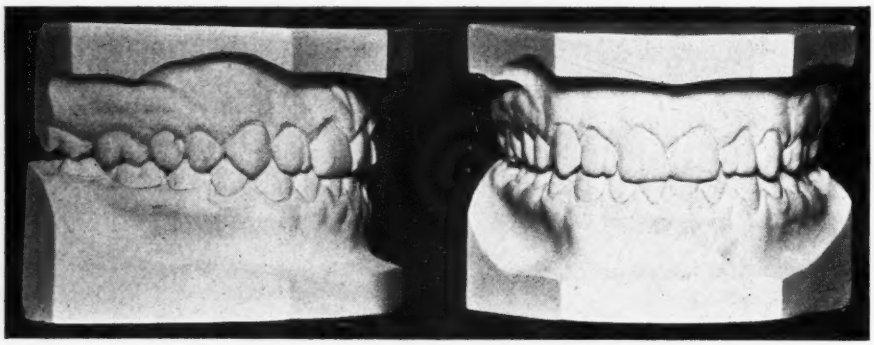


Fig. 5.

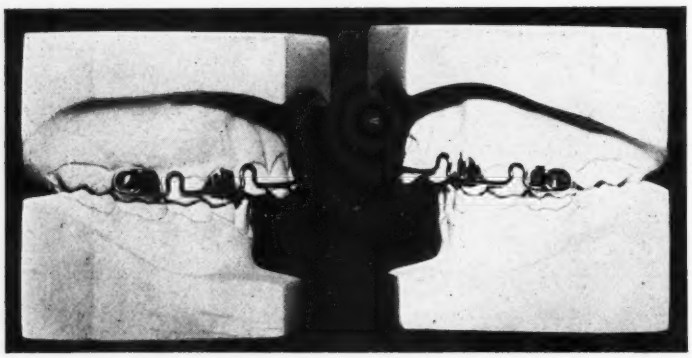


Fig. 6.

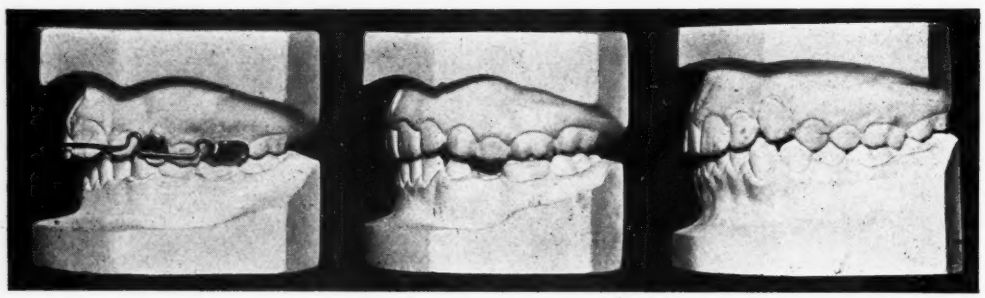


Fig. 7.

was inserted on the mandibular arch, and the masseter temporal exercises gradually added. The result as shown in the second model was obtained. Active treatment was rendered for about two years. The appliance was then removed and muscle exercises continued.

Fig. 8.—This shows the case today, April, 1928. Kindly note the molar relations.

Fig. 9.—Occlusal views in 1922 and in 1928. Note that there has been no tendency of the arches to collapse and yet no mechanical retainers were ever inserted.

Fig. 10.—Front view of the child. I regret to say that the photographs are not exactly the same size but I believe that you can note that around this area (mouth, lips, and cheeks) there is a marked difference. I appreciate fully that there has been a natural development of the face, yet those who are skeptical might say that the improvement would have taken place without any exercises. However, in this particular case the child did have exercises.

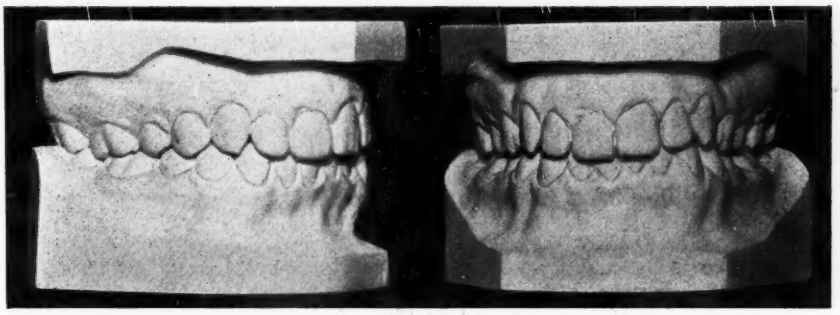


Fig. 8.

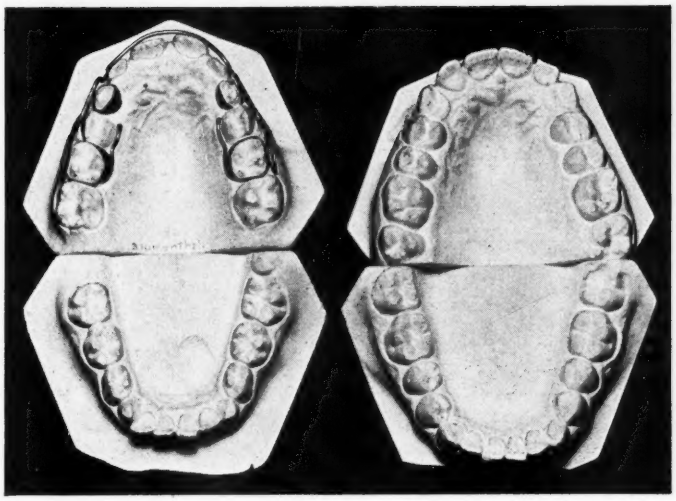


Fig. 9.

Fig. 11.—These are the profiles in 1922 and 1928.

In order to alleviate the many questions that are always asked of me after giving a paper or talk of this type regarding muscle exercises, I want to take a half moment of your time to quote from a reprint by Alfred Rogers, read before the American Society of Orthodontists in August, 1918, ten years ago, which might explain without further questioning as to what is being done in the way of treatment. He says:

"The principles of muscle training are:

"(1) The mechanical reestablishment of arch form and cusp relation by

the simplest mechanical means, thus removing any interference which tends to discourage the normal functions of the muscles;

"(2) The principles of muscular balance and mechanical advantage in the complete organism, including special guidance and control of those mus-

Fig. 10.

Fig. 11.

cles concerned and the particular weakness upon which our attention is to be directed, urging them on to their normal development and strength until the harmoniously developed face completes the restoration of the organism to its normal inheritance."

CASE REPORTS*

By Dr. Asa J. LaGrow, Oak Park, Ill.

THE purpose of my place on the program is to show a few cases in which muscle exercises were an important part of the treatment. We have just listened to a beautifully written paper on the philosophy of muscle exercises which needs no discussion because it is very complete.

In using this method I deem it very important to make frequent study casts during the treatment to determine where points of interference may be. A molar may need to be slightly rotated or there may be a slight inharmony

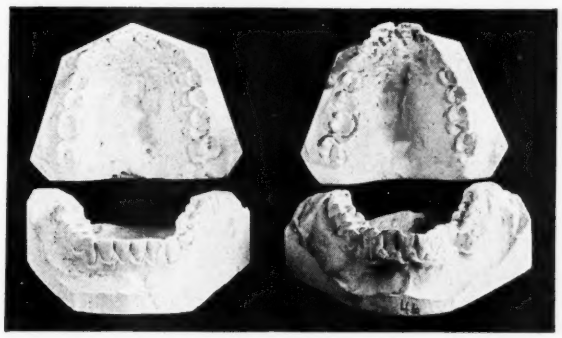


Fig. 1.

Fig. 2.

in the width of the arches, making exercises difficult and of little avail. The article by Dr. Rogers on this subject, which appeared in the October, 1918, issue of the *Dental Cosmos,* was the first one I read and I have been interested in the subject ever since. It will repay all of us to reread that article. The cases I shall show are all of Class II, Division I. The arch form and size was brought about by stimulation with appliances. There is nothing obscure or difficult to understand about the use of exercises in the treatment of malocclusions. To me it is very logical. The correction of the distal relation of the lower denture in these cases was brought about entirely by means of exercises.

*Case report read in connection with Dr. Roger's paper given before the American Society of Orthodontists, May 1, 1928, at Buffalo, N. Y.

Fig. 1, first case. The casts on the right side show the occlusal view of the teeth before treatment. The casts on the left side show the same view after treatment.

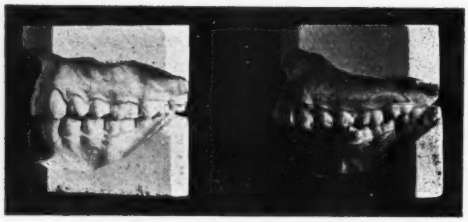


Fig. 3.

Fig. 4.

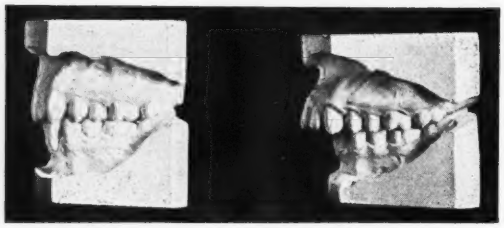


Fig. 5.

Fig. 6.

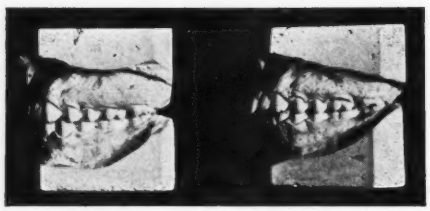


Fig. 7.

Fig. 2.—The right side here shows the front view of the case before treatment and the left side shows the improved relation.

Fig. 3.—The casts on the right side show the arch relation before treatment and the left side shows the improved relation.

Figs. 4 and 5 show another case, the views on the right being of casts of the teeth before treatment and the views on the left the improved condition.

Figs. 6 and 7.—Here is another case, the right side showing the original condition, and the left side showing the improved condition. In nearly all of these cases the lips are thickened and have no tone because of nonfunction. This condition of the lips can be greatly improved by exercises carried out consistently. The facial appearance is greatly improved thereby and the patient is much less likely to breathe through the mouth. The improved condition of the lips also aids in retention of the dental arch form. When exercises are carefully used, the time of the treatment can be shortened and our cases will relapse less often. In Class II cases where the lower denture is distal on both sides I consider this the only rational method of treatment. The period of mechanical retention is shortened in all cases.

CASE REPORT*

By Dr. Lloyd S. Lourie, Chicago, Ill.

AS YOU have noticed by the program, we are not expected to discuss the paper but simply to show that others besides Dr. Rogers are making use of these valuable methods of using the muscles themselves as orthodontic appliances.

I am very glad that in his paper, "Living Orthodontic Appliances," Dr. Rogers made it plain that the work is not limited entirely to the muscles alone and that one of the basic principles before using the muscles is to remove obstacles and provide mechanical advantage for the individual. This often requires the use of mechanical appliances preliminary to or incident with the muscle exercises.

In selecting cases to report here today, I was inclined at first to bring some in which only the muscles have been used. Those, of course, would be very simple cases, including some mesial occlusion cases, but I find that my greatest use of these methods is in distal occlusion cases, substituting the muscles themselves for the intermaxillary elastics. I have felt for years that that was one of the least efficient mechanical means that we used. The intermaxillary rubbers are at their greatest tension when the teeth are farthest apart, making a vertical influence, and exert their least influence when the teeth are nearing the position which we wish them to take. One of the conclusions that the gnathostatic method of making models has shown up clearly is the injurious effect of intermaxillary rubber bands on the occlusal plane of the dental arches, lengthening the maxillary incisors and mandibular molars.

*Case report read in connection with Dr. Roger's paper given before the American Society of Orthodontists, May 1, 1928, at Buffalo, N. Y.

The muscle exercise method in distal occlusal cases is of particular advantage in cases of open bite or where you wish to avoid opening the bite.

I have selected two cases, then, of distoclusion. In the first one (they will be approached with different purposes) the patient, having long overbite, would naturally be at a great disadvantage if asked to place the mandible and lower denture in normal mesiodistal occlusion with the other.

With the patient under such a disadvantage you could not expect much result and you probably would have the disadvantage of the maxillary incisors being forced labially in the effort to correct the occlusal plane of the two arches. So in this case the bite plate is used at first, for two purposes: (1) to give the

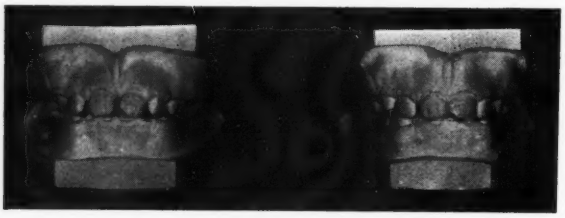


Fig. 1.

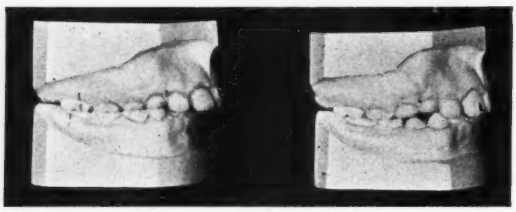


Fig. 2.

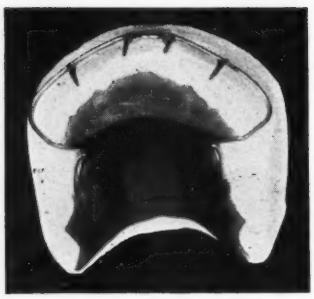


Fig. 3.

patient a mechanical advantage in transmitting muscular pressure for the purpose of correcting the abnormal occlusal planes of the arches, and (2) for preventing the patient from using the teeth in the previous abnormal position.

These cases are not unusual in any way except that they provide a basis for making some comments on the use of the muscles instead of intermaxillary elastics. It was not convenient to start a full corrective treatment in this so it was decided to concentrate the preliminary treatment upon the simplest thing that could be done. So the bite plate was made and the patient was given two exercises, the purpose of which was explained to him.

I find that one of the objections some men make to adopting this method of muscle training is that they cannot secure cooperation of the patient and I find if you will take a little time to explain the purpose, even to young children, you will be surprised at the interest and cooperation that they will show.

I explain to patients that in these cases they will be given a series of exercises and there is a definite purpose in each. In one exercise the mandible is to be thrust forward for the purpose of limbering up the joints of the intermaxillary articulation, and the other is to train the muscles to be used in a new position.

If you thrust the mandible forward as far as possible and exert masticating pressure on it, you will probably be surprised at the small amount of force that can be exerted. In other words, the patient is at a considerable

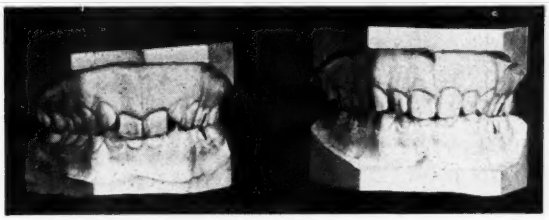


Fig. 4.

Fig. 5.

disadvantage, but that will be overcome within a few days if directions are followed. It is surprising how quickly it can be overcome.

Fig. 1.—This simply shows the change in the mesiodistal relation of the arches as brought about by use of the bite plate and the muscle exercises.

Fig. 2.—It is true that this can be produced without any direction of muscular effort, but I think it stands to reason that well-directed effort and retraining of the muscles by the use of the bite plate will produce the change much more speedily and much more expeditiously, and provide muscle retention for the result.

Fig. 3.—At first I was not going to show this because the particular form is not of great importance excepting in this, that a bite plate without any labial section would not be satisfactory because there would be nothing to prevent occlusion from carrying labially the maxillary incisors from the impact of the mandibular incisors, so that some sort of a labial section causing the maxillary incisors to be gripped between the plate and this labial section is necessary. Of course, at first there is no occlusion except on the mandibular

incisors and consequently the patient should not be expected to masticate with the plate in place, but if the patient is instructed to wear the plate all the time excepting at meals, and exert the muscles of mastication upon it, there will soon be an adjustment of the occlusal plane of the two arches.

Then, when the molars and premolars have gone close enough together to be used in mastication, the patient is instructed to wear the plate all the time because it is important that as soon as possible there will be established only one position or use for the mandible.

Figs. 4, 5, 6, 7, 8.—The next case is approached in a different way. This was a patient seventeen years old. It is a little more convincing possibly

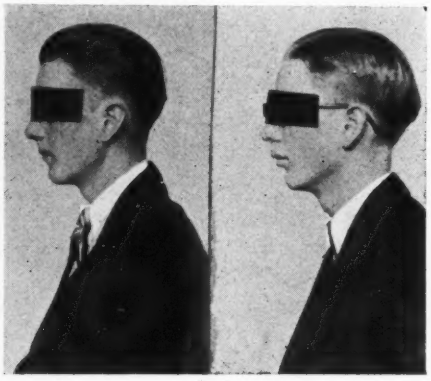


Fig. 6.

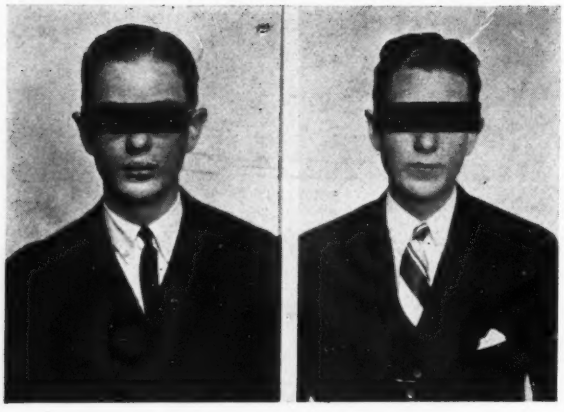


Fig. 7.

because of the fact that being a mutilated case the patient is at some disadvantage in the finished occlusion, but in spite of that, there has been a very satisfactory retention.

W. M., aged seventeen. Showing improvement in lips and mandible position by muscle exercises. Patient was advised that principal lip improvement could be accomplished without orthodontic treatment, and lip exercises were started immediately. In addition, he was instructed to thrust the mandible forward vigorously, at regular intervals, principally before meals, for the purpose of limbering up the temporomandibular articulation and strengthening the pterygoids, which should hold the mandible forward.

No exercise of the temporal masseter group was begun until there was provided a fair occlusion with the mandible in the forward position. In this case it was at the end of three months' orthodontic treatment of the dental arches. The muscles of the temporal masseter group in addition to the pterygoids, were then exercised at regular intervals to improve and establish occlusion with the new relation of the arches. These exercises are advised just preceding meals in the hope that the patient will be more likely to use the mandible in the forward position for mastication.

Fig. 8.

No intermaxillary force other than muscular was used either in changing or retaining the dental arch relations. The patient was away attending college so mechanical treatment was possible only during vacations. The retaining bands were removed two years from beginning of treatment. The second photographs (Figs. 7 and 8) were made nine months after the removal of retainers and the second set of models a year and a half after removal of retainers. Lip and occlusion improvements dependent upon changed muscle function are holding nicely although some rotation of maxillary lateral incisors has occurred.

DIRECT METHOD OF ADAPTING SEAMLESS MOLAR BANDS*

By Herbert A. Pullen, D.M.D., Buffalo, N. Y.

THE technical methods in use by the orthodontist, whether direct or indirect, are first, the result of his knowledge, and second, the acquisition of a habit of performing the technic which becomes easier each time it is repeated. Thus, one may learn one of these methods, possibly an indirect rather than the direct method, become accustomed to it through daily repetition, until it becomes an easy way or habit of doing this particular technic.

However, in learning an indirect method of doing any technic, one may be doing the work the hardest way, performing many unnecessary steps, and attaining a final result which is inferior to the direct method of doing the same thing.

Direct methods, according to the meaning of the word, direct, are "free from intervening agencies or conditions." Indirect methods, on the other hand, are those which do "not tend to a result by the shortest or plainest course."

In the days of the horse drawn vehicles, the most direct way of crossing the street was the shortest distance from curb to curb; today, only the jay walker risks his life in this manner, others walking indirectly to the same goal by going first to the street corner, crossing with the "Go" signal to the opposite side of the road, and back on the trail to the destination.

In this illustration, the direct method of crossing the street is not free from intervening agencies, hence, it is inadvisable, and the indirect method is preferable.

So it may be in some technical methods in orthodontia that the indirect method is advisable, as, for example, in the taking of impressions of the teeth, making casts, and constructing an appliance like the lingual arch in the laboratory; for the reason that such an appliance could not be easily adapted to the mouth at the chair, or if it could, it would require more time than either the patient or the operator could give at a sitting.

But there is one technical method in orthodontia which in the opinion of the writer ought to be a direct method, and that is the construction and adaptation of the molar bands preparatory to the construction of either a labial or lingual arch, and simply because it is "free from intervening agencies or conditions," other opinions to the contrary.

The statement has been made that the indirect method of making and adapting molar bands upon duplicate plaster teeth or metal casts thereof, and placing them upon the molars completely finished is more comfortable for the patient than adapting the bands to the molars in the mouth by the

*Clinic presented before the Twenty-sixth Annual Meeting of The American Society of Orthodontists, Chicago, May 2-5, 1927.

direct method, but this is usually an alibi for a lack of knowledge of a direct habit technic which has been planned to overcome just such criticism.

A carefully planned technic in the direct method of making and adapting molar bands is no more uncomfortable than the indirect method, and in the use of the latter method, when the bands are finally placed upon the teeth, the same discomfort, if any, would be finally produced in their placement, with perhaps some additional discomfort due to some lack of perfect adaptation caused by the changes in size and form in passing through the multiple steps of an indirect technic.

It is with the object of offering a carefully planned and proved technic in the direct method of adapting molar bands that the writer presents the following method of adapting seamless molar bands with a slight variation and improvement in technic over a direct method of making and adapting molar bands published in 1921.

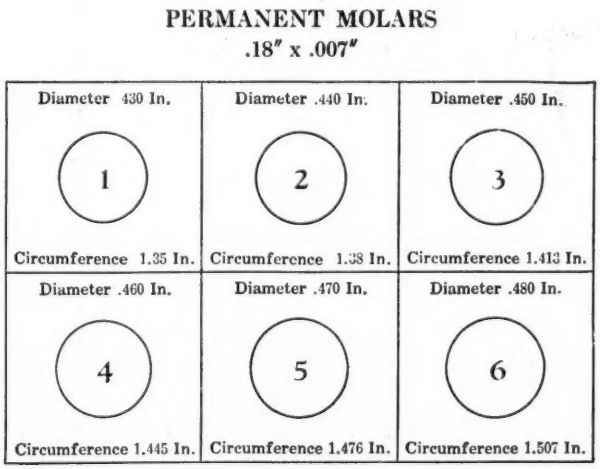


Fig. 1.—Six selected sizes of seamless bands nearest to and including the average size 1.413″.

The basis of the improved technic is the keeping in stock of a sufficient number of graded sizes of seamless molar bands of precious metal alloy to fit the variation of sizes of molars in the mouths of patients, so that one does not have to begin by measuring the circumference of the teeth and make a special band from the measurement of an individual molar.

In the earlier technic band material was cut in lengths varying 0.002″ from 1.32″ to 1.50″, these bands being soldered in cylindrical form, and placed in numbered compartments ready for instant use at the chair, by selecting the proper size for a given tooth and adapting it to the molar at that time.

The improved technic consists in the use of seamless bands, which saves the time of cutting and soldering band material, and in the use of about one-half the number of sizes formerly used, six sizes being found enough to fit the average run of molar sizes, Fig. 1, without having the multiplicity of sizes in the older technic.

The Williams Gold Refining Co. have been furnishing these six sizes in gold, platinum and palladium, and Baker & Co. furnish the same sizes in

platinum and palladium. Larger sizes for extra large molars, and smaller sizes for unusually small first molars, for second molars and for deciduous molars are also furnished by the manufacturers, but are not included in the six average sizes for obvious reasons. Both of these manufacturers have co-operated with the writer in providing a perfectly adaptable band material, of high fusing point, noncorrosive and nonoxidizing, and of splendid edge strength, all of which qualities are necessary for the making of a strong, close fitting molar band.

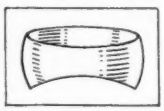


Fig. 2.—Selected size of molar band with gingival crescents cut out.

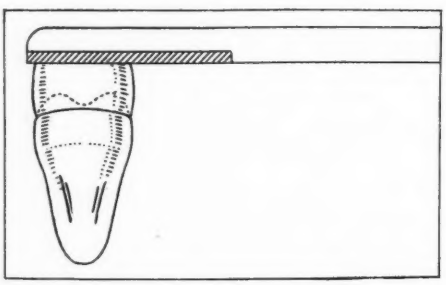


Fig. 3 —Forcing selected molar band at contact points with band setter.

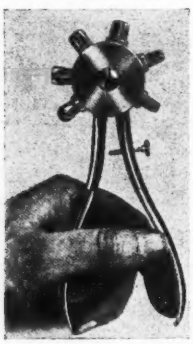


Fig. 4.—The Taylor Band Stretcher.

The quality of adaptability is stressed because it is necessary that a band should be adapted to the surfaces of a molar without springing away under manipulation. First molar bands should be 0.18″ wide and 0.007″ in thickness.

The circumference of the average first molar is 1.413″, according to the standard gauge of the manufacturer, and the most used sizes of seamless bands other than this size range from two numbers below to three numbers above this gauge. The sequence of steps in the technic is as follows:

1. Select the approximate size of first molar band from the graded sizes shown in Fig. 1, remembering that the average size is 1.413″.

2. Adjust selected size over crown of molar to contact points only, when it will be observed whether band is too large, too small, or the correct size. If too small, the band will not reach the contact points; if too large, it will easily reach contact points, and show space between band and tooth.

3. Correct size having been selected, which is usually done the first time after a little experience, the band is annealed and flattened mesially and distally with a wide flat-nosed plier.

4. A crescent-shaped piece is next cut out from the mesial and distal gingival margins as in Fig. 2 to protect interproximal gum tissue. Rough edges thus made should be filed smooth.

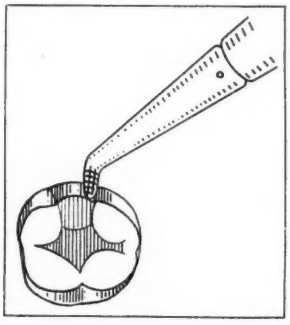


Fig. 5.—Adapting occlusal edges of band with Young band adapter.

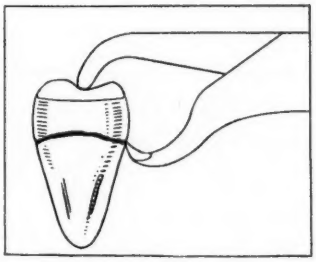


Fig. 6.—Removing band with Pullen band remover

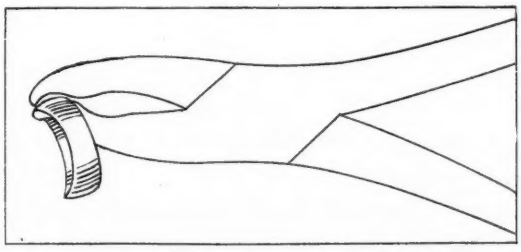


Fig. 7.—Contouring band with S. S. White pliers No. 114.

5. Force selected band over molar past the contact points with the Pullen band setter, Fig. 3, until gingival edge of band reaches just beneath gum margins buccally and lingually.

6. If the band is slightly smaller than desired, it may be stretched with the Taylor Band Stretcher, Fig. 4, to the proper size. This instrument will also give the band a slight taper which is especially desirable in fitting it to a lower molar.

7. If the band fits the molar snugly the occlusal edges should be adapted to the molar buccally and lingually, mesially and distally with the Young band adapter, Fig. 5, being careful not to allow the edges of the band to extend over the occlusal margins of the molar. Cutting out a shallow crescent from the mesial and distal occlusal margins will prevent any such extensions.

8. Remove band with the Pullen band removing plier, Fig. 6, exerting pressure at the mesial and distal angles, thus freeing band at contact points first, using just enough pressure not to mar the edge of the band with the plier.

9. Contour bucco- and linguo-gingival edges of band with the S. S. White contouring pliers No. 114, Fig. 7. Also, contour the entire occlusal edge of band, giving the mesial and distal edges very slight contour.

10. Anneal band again and replace on molar with band setter, readapting the band finally with the Young band adapter, when its perfection of fit is assured and it is ready for anchor attachments.

ADVANTAGES OF DIRECT METHOD WITH SEAMLESS BANDS

The direct method of fitting seamless bands to the molars in the mouth saves the operator considerable time over the indirect method with its impression, cast, metal die, and other multiple steps.

The use of the seamless band with the direct method saves the labor and time in cutting and soldering band material as when soldered bands are made up in the graded sizes.

The seamless bands, being numbered with a rubber stamp and placed in correspondingly numbered compartments, are instantly ready for selection and fitting to a molar.

A more perfectly fitting band can be made over the natural tooth in the mouth than over the duplicates in plaster or metal by the indirect method.

Separation of the teeth is usually unnecessary in the use of the direct method unless the patient is an adult.

Attachments for anchorage may be made to the seamless band without danger of opening a seam, and the directly made band may be cemented in position at the first sitting.

If the appliance is to be made in the laboratory, and impression of the molar bands may be taken at the first sitting, the bands removed in the impression, and the appliance made on the cast obtained therefrom, ready at the second sitting for placement in the mouth.

The direct method requires the least number of individual steps, the least number of assistants, and is saving of time and effort.

THE LABIAL AUXILIARY SPRING*

By Andrew Francis Jackson, D.D.S., Philadelphia, Pa.

THE course of orthodontic progress has been marked by violently contrasting differences of opinion in many of its aspects. In present-day methods of treatment there is a wide gulf between the advocates of the ribbon or pin and tube types of appliance and the advocates of the lingual arches with

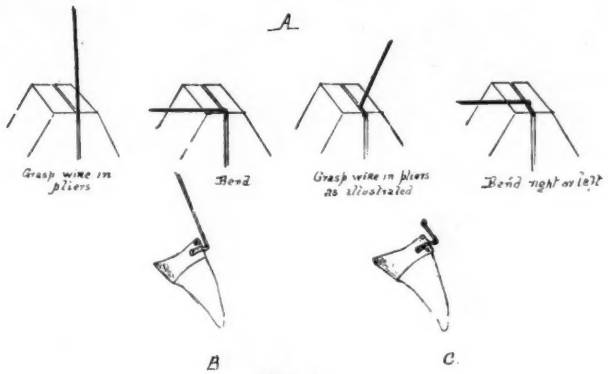


Fig. 1.

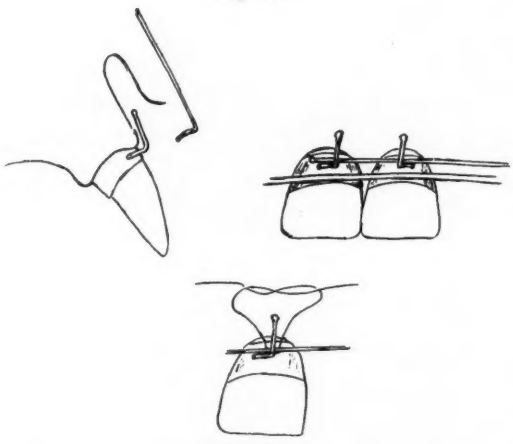


Fig. 2.

auxiliary springs. It is not the object here to criticize the qualities of any type of appliance, but among the qualities to be desired in any appliance might be mentioned the following:

Ease of manipulation, ability to produce gentle continuous pressure to induce physiologic movement of crowns and roots of teeth with a minimum of trauma, but at the same time with sufficiently definite action not undesirably to hinder progress, self-limitation of action, and ability to allow of different types of action to be carried on at the same time, without the one interfering

*Clinic presented before the Twenty-sixth Annual Meeting of The American Society of Orthodontists, Chicago, May 2-5, 1927.

with the action of the other, i.e., the action necessary to produce changes in jaw relations with the action necessary to produce bone development and individual tooth movement.

It is my experience from many cases treated that the labial arch with labial auxiliary springs, in combination at times with the lingual arch with auxiliary springs, more nearly fulfills the requirements mentioned than any other appliance as yet tried. The technical details of the construction of these appliances, as used in my practice, follow, with a description of their application to certain individual cases treated.

LABIAL HOOK ATTACHMENT (FOR INCISORS AND CANINES)

The pressure from the labial auxiliary spring produces its effect by exerting pressure lying within the labial hooks. This allows of great individuality of tooth movement and pressure in any direction desired. The tooth to be

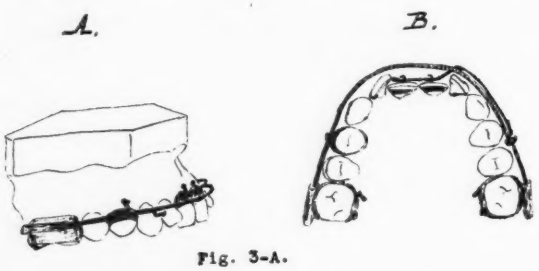


Fig. 3-A.

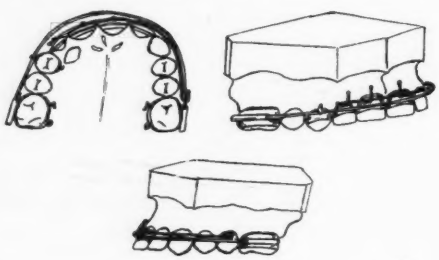


Fig. 3-B.

moved should first be suitably banded. A piece of 0.022 platinized gold wire is then bent in the manner shown in Fig. 1-*A*, and soldered at the desirable location, depending on circumstances, as shown in Fig. 1-*B*. The desired length is then cut off and a knob is melted on the end (Fig. 1-*C*). As a means of identifying rights from lefts when several bands are being inserted at the same time, the soldered end on the band should always point toward the distal. This method insures strength by giving a long soldering surface. These attachments are usually soldered with the ends pointing gingivally for obvious reasons, but occasionally it is desirable to point the ends incisally.

The labial spring is soldered on the main labial arch at some desirable point distant, bent in the desired direction, and sprung under the labial hooks. It is then tied with No. 0 ligature to one or more of the hooks, as illustrated in Fig. 2.

The main labial arch is bent to a form which will not interfere with the tissues but will leave some space between the arch and the teeth to be moved,

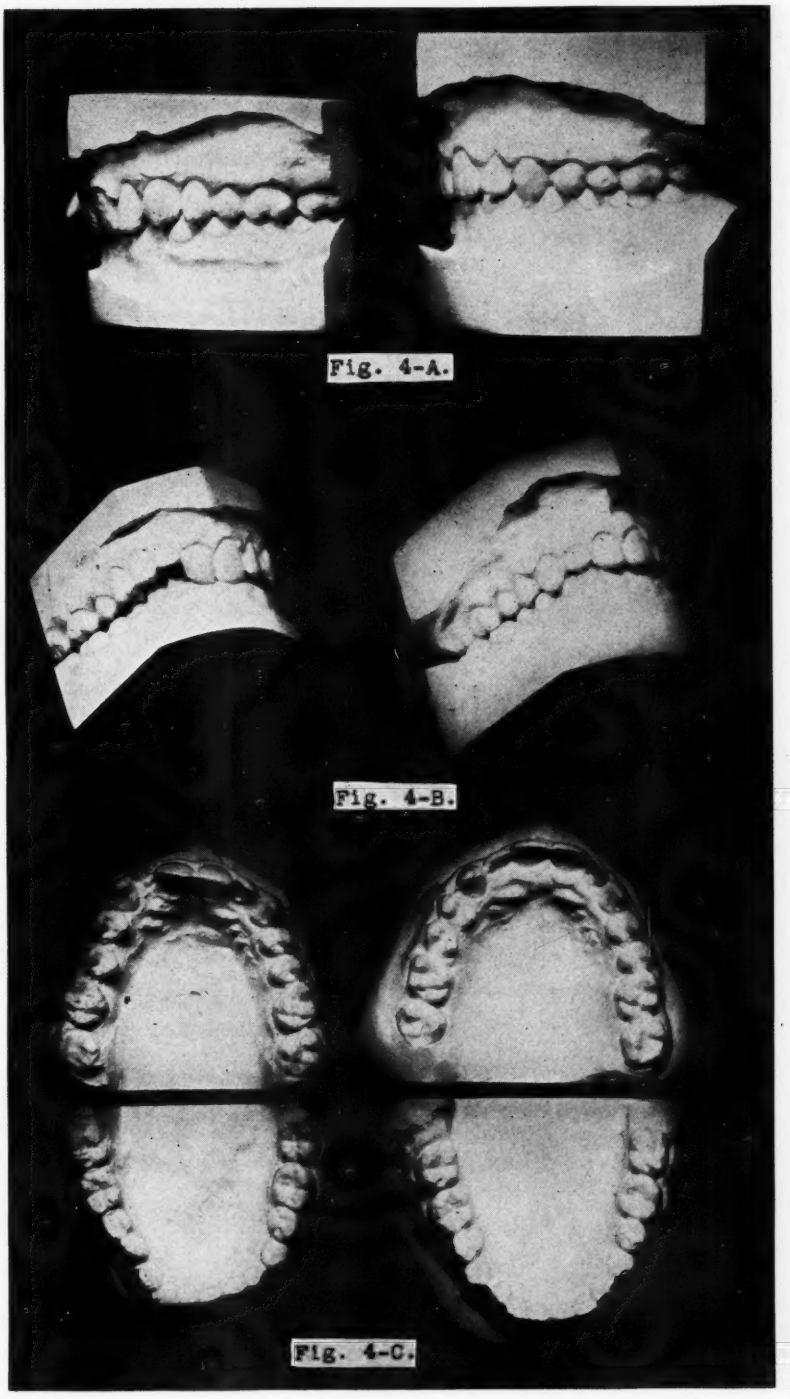
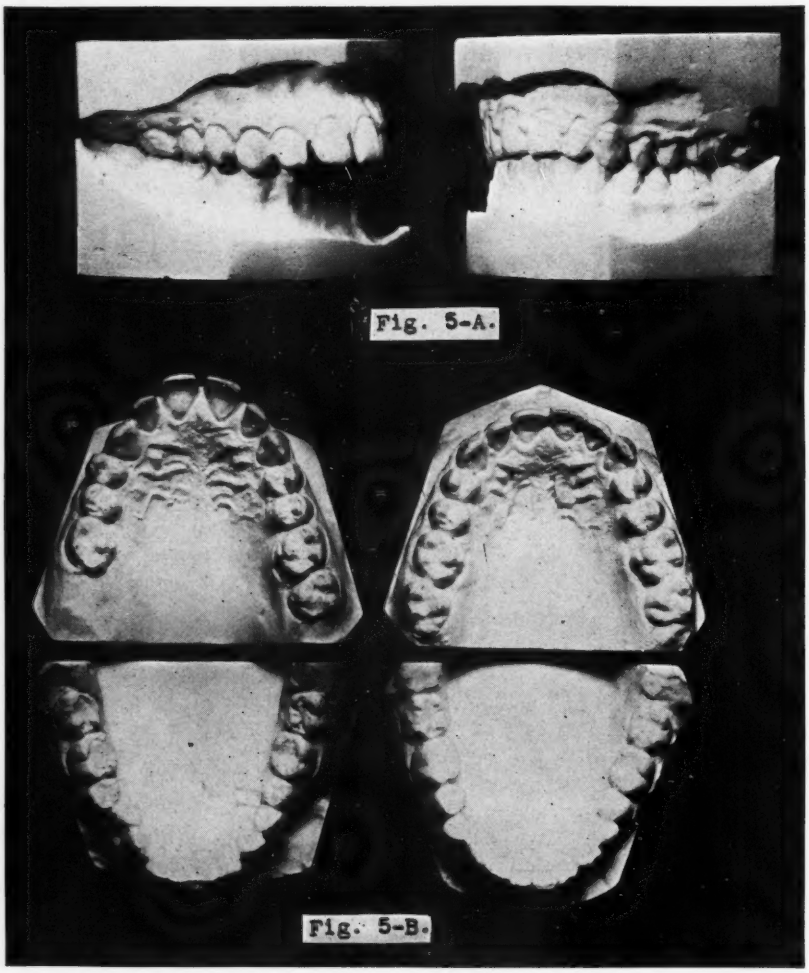


Fig. 4-A.

Fig. 4-B.

Fig. 4-C.

and the pressure of the auxiliary springs will then bring the teeth in contact with the arch and stop when this point is reached, as the main arch will not permit of any further movement, thus being self-limiting in action. (Fig. 3—*A* and *B*.)



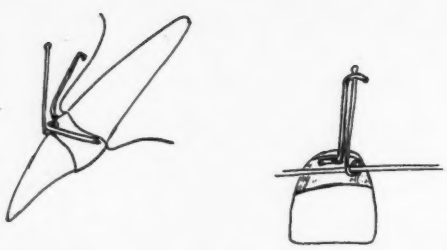


Fig. 6.

With this type of appliance, as will be readily seen, intermaxillary elastics may also be used, producing changes in the mesiodistal relations of the jaws and distal movement of the molars, simultaneously with the movement forward of the incisors, without causing any interference of the action of the one with the other.

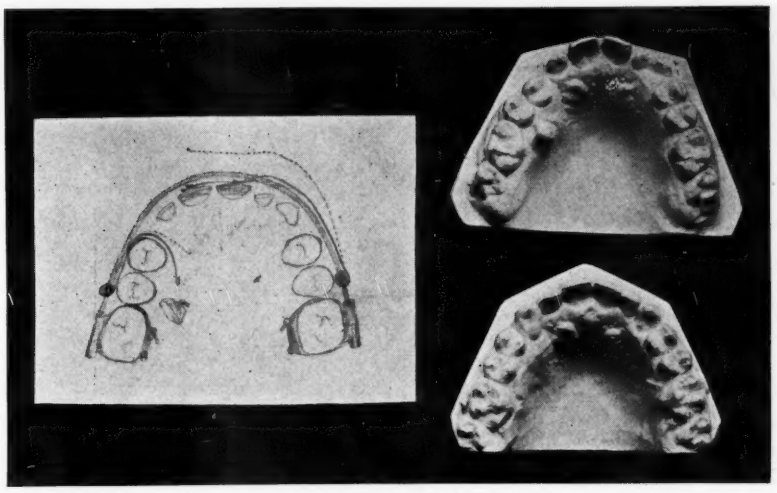


Fig. 7.

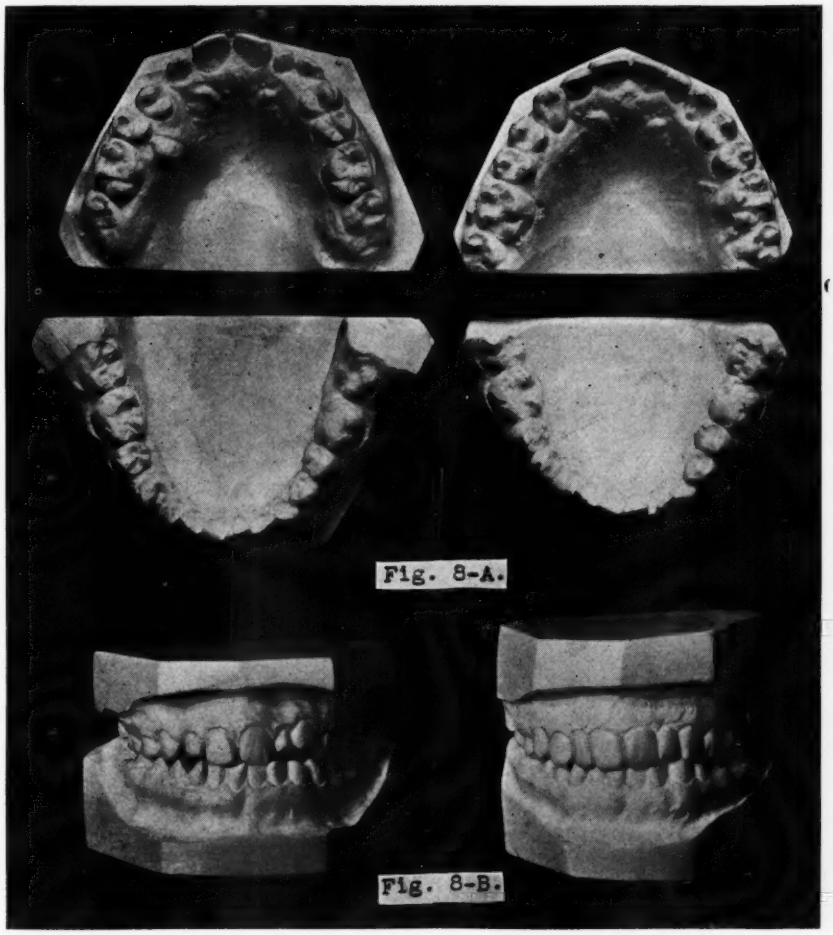


Fig. 8-A.

Fig. 8-B.

In cases of deep overbite, the labial auxiliary spring may be bent gingivally, sprung down into place and tied, producing a depressing force on the incisors, while at the same time the main arch may be tied to hooks on the first premolars. The action of this, combined with the use of intermaxillary rubbers, is to produce pressure downward on the premolars, and thus, in a

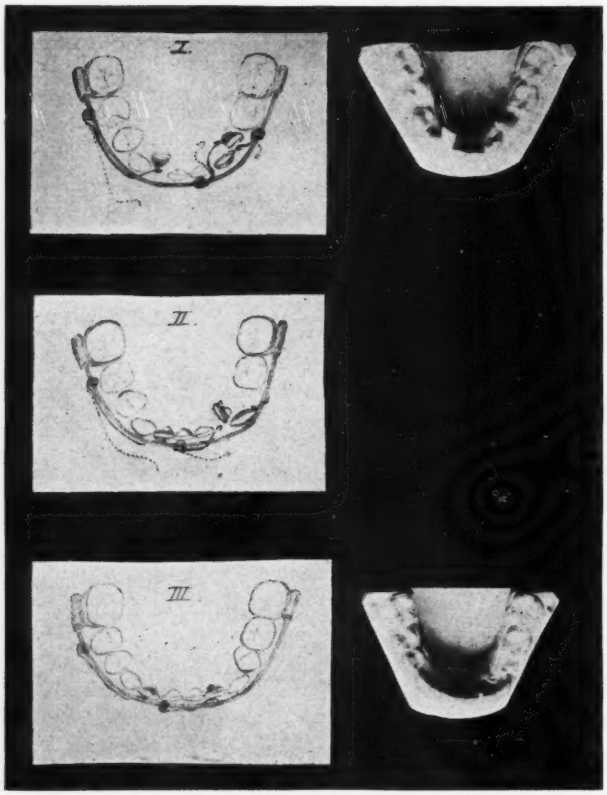


Fig. 9.

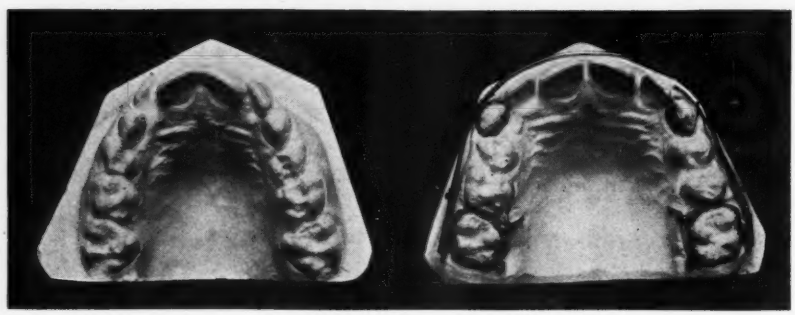


Fig. 10.

very easy and efficient manner, alter the vertical arrangement of the teeth. An example of a case treated by this method is shown by a comparison of the models illustrated in Fig. 4—*A*, *B* and *C*.

At times it is desirable in cases of distoclusion with labioversion of the incisors (Angle's Class II, Div. 1) to move the incisors distally and at the same time correct the relation of the jaws. The method in common use of

allowing the labial arch to slide through the tubes has been used many times efficiently, but the use of labial auxiliary springs, with pressure inward, is so definitely superior that it cannot be too highly recommended. An illustration of this method of treatment is shown in Fig. 5—*A* and *B*.

The labial hook attachment, placed as it usually is, at the gingival margin of the tooth to be moved, is found by actual experience of hundreds of cases treated, to produce all the root movement desirable in the majority of ordinary cases. When, however, more than the ordinary amount of root movement is desirable, the modification, as illustrated in Fig. 6, may be employed.

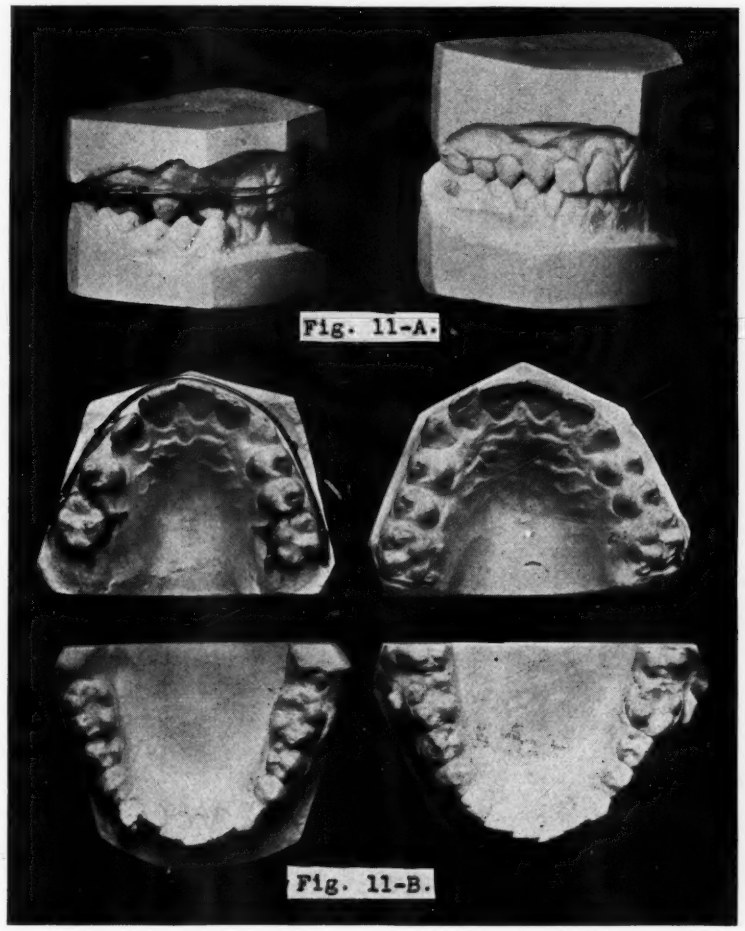


Fig. 7 shows an extreme case of individual tooth movement. The upper right cuspid was moved to place from a position originally located between the upper right molar and second premolar. This case was complicated by open-bite, and had to be handled with extreme care so as not to aggravate this condition. An appliance, as illustrated in the diagram in Fig. 7, was used in this case. The action of the labial springs does not depress the teeth moved. Muscular exercises, in combination with the treatment and the placing of two porcelain jacket crowns on the pegshaped laterals, produced the result shown. After the space had been obtained for the canine and the crown of the tooth

was occupying its correct position mesiodistally, the root was still inclined too far distally and lingually. This was then very much improved by using the type of appliance in Fig. 6, the auxiliary spring on the main arch in this case being bent buccally and mesially and sprung into place and tied. The result is shown in Fig. 8—*A* and *B*.

Fig. 9 shows the models, with a diagram of the type of labial arch with auxiliary springs which was used to treat a case of transposed canine and

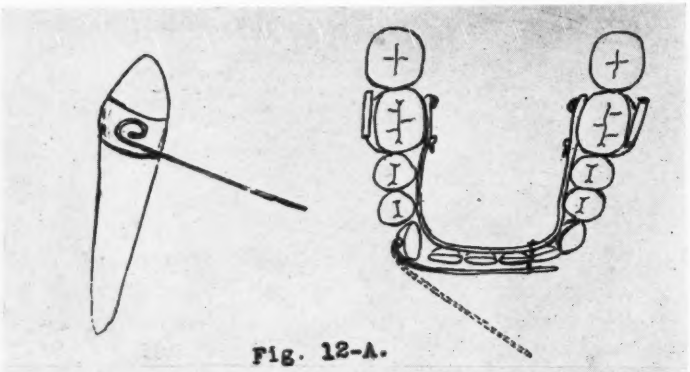


Fig. 12-A.

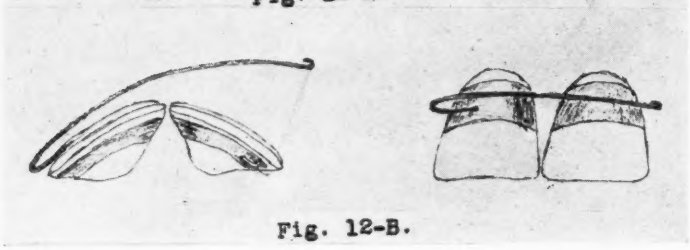


Fig. 12-B.

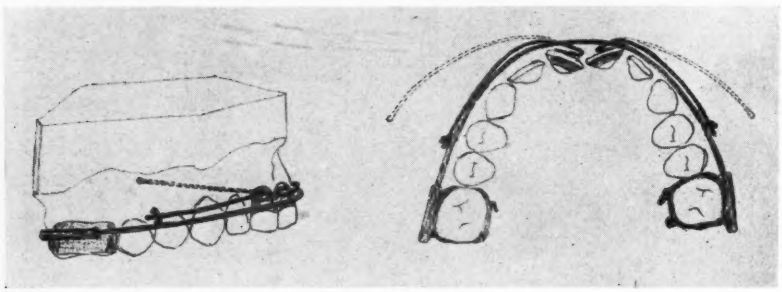


Fig. 13.

(rotated) lateral on a child of ten years of age. The work accomplished, as shown in the models, was done in less than a year, with practically no inconvenience or soreness.

Fig. 10 shows the expansion obtained from canine to canine in a child of nine years of age. The expansion in the main arch was obtained by stretching with wire-stretching pliers. There is no method that I know of which will accomplish this kind of result more easily and positively. Adjustments were made about every six or eight weeks.

Fig. 11—*A* and *B* shows the result obtained in a case of impacted canine and premolar with labioversion of a lateral. The central incisors were also

banded and moved before the case was completed and a lingual arch, with auxiliary spring, was used to move the premolar into place after space had been obtained with the labial arch.

All manner of rotations may be accomplished by soldering an auxiliary spring to the bands of the teeth to be moved. Two illustrations of the technic of accomplishing this are shown in Fig. 12—*A* and *B*.

An illustration of how the inclination of a root and the rotation of a tooth may be accomplished simultaneously with gentle continuous pressure with great ease of manipulation is shown in Fig. 13.

Fig. 14.

An illustration of the practical result in tooth rotation by the method described is shown in the right mandibular canine in Fig. 14. In this case the room necessary was first obtained by using combinations of the labial and lingual arches with auxiliary springs. The maxillary left lateral incisor was carried to the correct line of occlusion from its position of linguoversion by means of a labial auxiliary spring.

The cases here illustrated show but a few of the adaptations to which the method may be applied. The underlying principle I have found efficient in practice and I believe sound scientifically.

DEPARTMENT OF
ORAL SURGERY, ORAL PATHOLOGY AND SURGICAL ORTHODONTIA

Under Editorial Supervision of

Sterling V. Mead, D.D.S., Washington, D. C., Director

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MAXILLOFACIAL PROSTHESIS*

Technic of Splint Construction

By Roy L. Bodine, D.D.S., Washington, D. C.
Captain, Dental Corps, U. S. Army

(Continued from page 1076, December issue.)

THERE are many varying conditions which may present in cases of fractures of the jaws which will govern to a considerable extent the technical procedures which are to be followed in constructing the splint. For example, a case of recent fracture may be simple, with slight displacement and no soft tissue injuries, with the patient conscious and in condition to be operated upon in the dental chair, or, on the other hand, it may be compound or comminuted, complicated by lacerations of soft tissues or by extensive loss of substance, with the patient unconscious or anesthetized. Cases of ancient fractures may be complicated by fibrous union in extreme malposition, trismus in any degree, constricted ora, or similar conditions which would interfere seriously with any intraoral operations. These complications would influence the choice of the impression technic to be used.

IMPRESSION MATERIALS

For splint impressions a material is required which will give an accurate reproduction of the essential areas, which is suitable for use under the conditions encountered with the minimum of discomfort to the patient, and which will, if possible, permit the construction of metal models.

Plaster of Paris has the following advantages: it is painless to insert, and can be removed sectionally with very little pain; its expansion on setting helps to compensate for the shrinkage of the casting, and it permits the use of fusible metal models, the expansion of which gives further compensation. Its

*From the Department of Prosthesis, Army Dental School, Washington, D. C.

disadvantages are: it is more or less dangerous to use in a reclining position or under an anesthetic; it does not compress soft tissues, and is not easily muscle-trimmed.

Modeling compound is safe to use under any circumstances, and gives uniform compression and marginal trim, but the pressure necessary for its insertion causes considerable pain; if not properly chilled it is distorted on removal while if chilled its removal causes severe pain, and it does not permit the use of metal models.

With these properties of the materials in mind, the choice of impression methods for the various types of cases would be as follows:

IMPRESSION METHODS

Mandible:

Class I.—Simple fractures. Plaster impression of the mandible, and a compound impression of the occlusal third of the maxillary teeth. (For mandibular jacket only.) Complicated fractures. Plaster impressions of both mandible and maxilla. (For intermaxillary splints.)

Fig. 40.—Showing the amount of plaster needed for the upper and lower impressions. No plaster in the palatal portion of the upper tray.

Class II.—Plaster impressions of both mandible and maxilla, with an additional compound impression, muscle-trimmed, of any edentulous area which is to be covered with a saddle.

Class III.—Full compound impression of the mandible, and a compound impression of the occlusal third of the maxillary teeth.

Maxilla:

Class I.—Plaster impression of the maxilla, and a compound impression of the occlusal third of the mandibular teeth.

Class II.—Plaster impression of the maxilla, and a compound impression of the occlusal third of the mandibular teeth. (Note: In rare cases intermaxillary splints will be indicated, and plaster impressions of both maxilla and mandible will be needed.)

Class III.—Full compound impression of the maxilla and a compound impression of occlusal third of mandibular teeth.

IMPRESSION TECHNIC

Plaster.—Select an orthodontia tray, which is large enough to allow at least 3 mm. of space between the tray and all teeth. Lubricate the tray freely with vaseline or cocoa butter. Use a small amount of plaster, filling the occlusal portion of the tray approximately half full of plaster (Fig. 40). No plaster is needed in the palatal portion of the upper tray, as an impression of the teeth and about 5 mm. of the gingivae are all that is required. Insert the tray gently, allowing at least 2 mm. of plaster to remain between the occlusal surfaces of the teeth and the tray. When the plaster is thoroughly set, remove the tray and groove the impression along the occlusal surface and ver-

Fig. 41.—The sectioned plaster impressions after removal.

tically on the labial surface over each cuspid. Remove the labial section, then the buccal section and finally the palatal or lingual section (Fig. 41). With ordinary care, this operation can be carried out without appreciable pain to the patient, and anesthetics are not to be considered.

Compound.—For occluding models, a small amount of compound in an ordinary tray will give an impression of the occlusal third of the teeth. Since this impression will be taken of the uninjured jaw, it can be thoroughly chilled before removal, and no sectioning is necessary.

For edentulous saddles, construct a special tray to approximately fit the area. Take a matrix impression, using care to not allow the tray to approach within 3 mm. of the tissue, chill and remove. Trim the matrix impression to

the desired outline, and rewarm the inner surface and the margins to a flowing consistency with a mouth blow-pipe. Reinsert under pressure, and maintain the pressure while muscle-trimming the periphery and until thoroughly chilled, before removing (Fig. 42).

For Class III cases, use a compound full denture technic modified to suit the case. Uniform tissue compression and peripheral trim are very important,

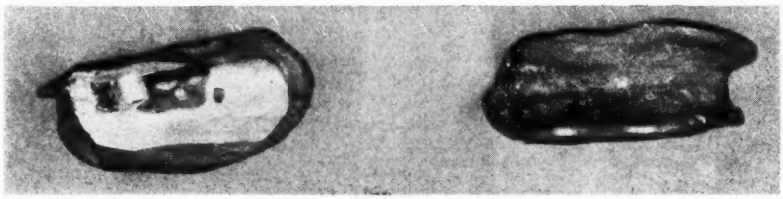

Fig. 42.—Muscle-trimmed compound impression of an edentulous area for a saddle.

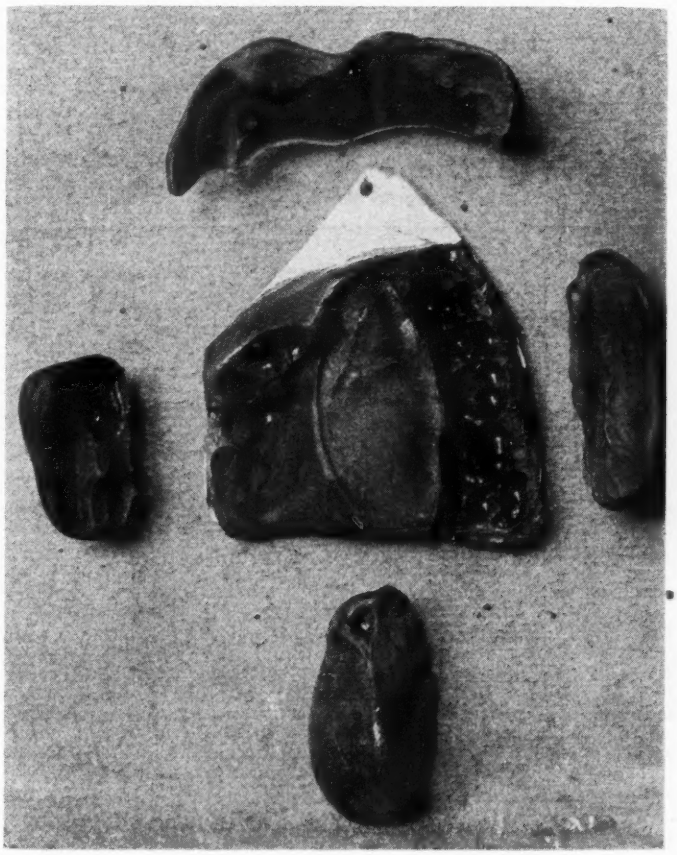

Fig. 43.—Sectional impression in a case of microstoma. The vault portion is adapted with the forefinger as a separate section in order to reduce the mass of compound in the tray to a bulk that can be introduced into the mouth.

as the opportunity to remove the splint for trimming will not be afforded as it would be in full denture work, so the muscle attachments must be freed completely at the time the impression is taken. Post dam and valve seal are unimportant, as the appliance will be retained mechanically.

For anesthetized or recumbent patients use a sectional compound partial denture technic. This is a difficult procedure under such circumstances, but with patience and care a satisfactory impression can be secured.

For constricted ora. In cases with old injuries to the lips with resultant scar contraction and oral constrictions, the compound partial denture technic should be used, but the sections will probably be smaller and more numerous than in denture technic. It may be necessary to reduce the width of the tray in order to succeed in inserting it at all, and any considerable vertical depth

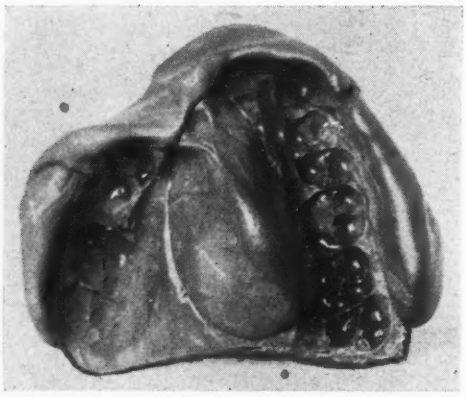

Fig. 44.—The same impression, assembled.

Fig. 45.—Plaster impressions boxed with moldine preparatory to pouring fusible-metal models. The palatal portion of the upper impression is blocked out.

to the impression may be impossible. In these cases, insert the vault section of the upper impression, and the lingual flange portions of the lower impression with the fingers, so shaping them that they will not be dislodged by the withdrawal of the succeeding sections. Lubricate the surfaces of these sections with cocoa butter, or cover them with wet tissue paper, and then insert the tray with a quantity of compound barely sufficient to cover the occlusal surfaces of the teeth. Lastly, add the buccal and labial sections. All sections must be thoroughly chilled before their removal is attempted (Figs. 43 and 44).

The impression of the uninjured jaw should be taken first in all cases.

MODELS

After the sections of the plaster impression are reassembled in the tray, it should be boxed with a roll of moldine (Fig. 45), and the teeth poured in fusible metal, immediately. Wood screws placed while the metal is molten afford attachment to the plaster base. After the metal has chilled, the impression is boxed with wax and the plaster base poured, using model plaster (Fig. 46). The resulting models are shown in Fig. 47.

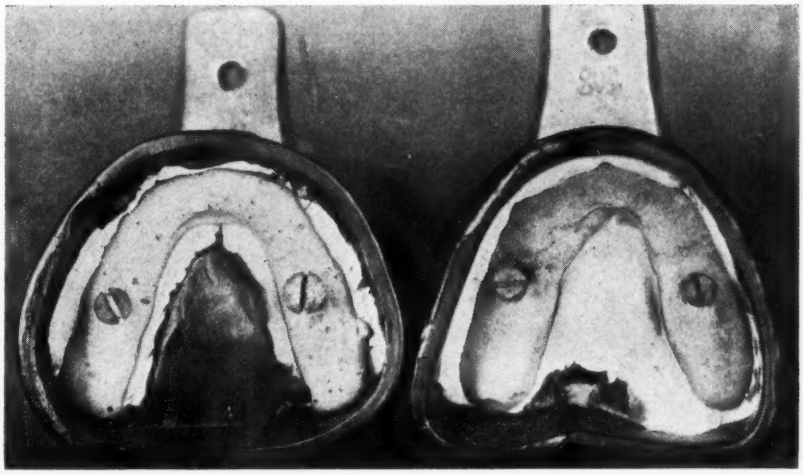

Fig. 46.—Showing the metal models with wood-screws inserted to provide retention. The impressions are boxed with wax for the plaster basis.

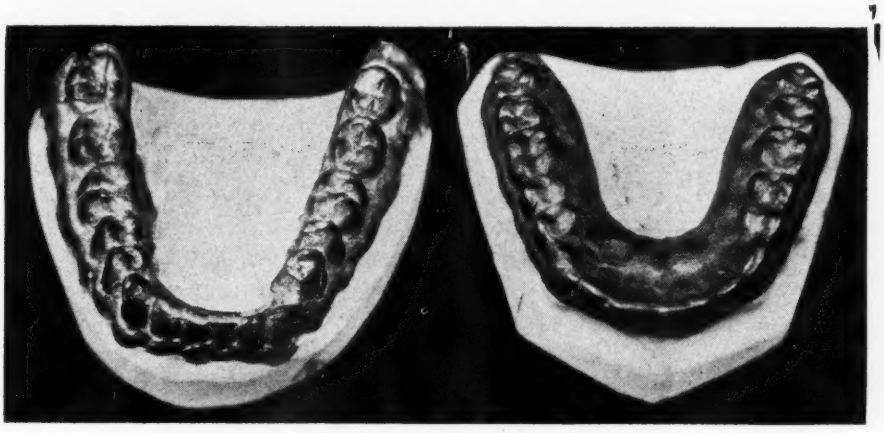

Fig. 47.—The completed models.

Compound impressions for occluding models should be poured in a fine artificial stone which is not easily broken or chipped. Compound impressions for saddles and of edentulous cases should be poured in one of the coarse stones which resist vulcanization.

ARTICULATION

Section the model with a saw through the fracture lines into as many pieces as there are fragments of the jaw. Reassemble these sections in their normal relation in proper occlusion with occluding model. Usually the facets

of the teeth will be sufficient guide to an accurate replacement of the fragments (Fig. 48). In some cases it will be necessary to use a bite for this purpose, the simplest form of which is a sandwich bite of tin-foil and wax, taken of each fragment in turn, with the fragment placed in its normal position in the mouth by digital force (Fig. 49).

The more complicated cases of mandibular fracture, where sufficient guides to normal occlusion are lacking, will require mounting on a special ana-

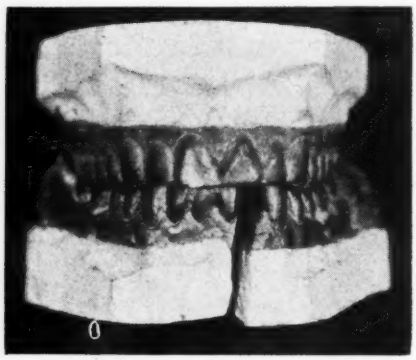

Fig. 48.—The lower model has been sectioned through the fracture line, and reassembled in occlusion with the upper model, using the worn cuspal facets as the guide.

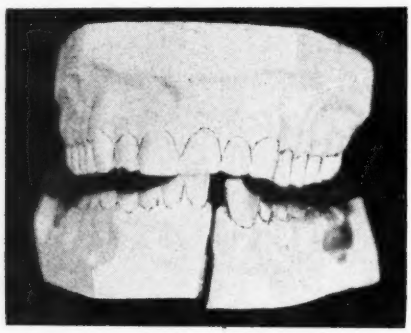

Fig. 49.—In some cases wax-foil sandwich bites may be used. These are taken of each fragment in turn while it is digitally reduced.

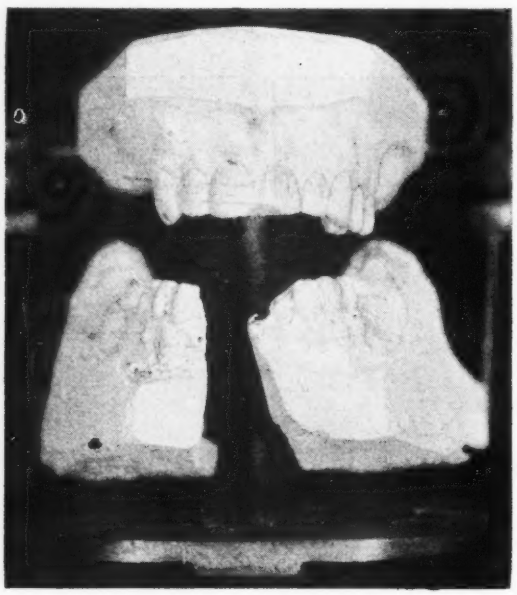

Fig. 50.—Showing the models mounted on a Guilford fracture articulator using a "Mush" bite and the face-bow. After sectioning they can be swung about the condyle centers, duplicating the movements in the mouth.

tomic articulator. Take a biscuit bite of the case in the collapsed position, and transfer it to a Guilford fracture articulator, using a face bow. The pieces of the model representing the fragments that are attached to the condyles are luted to the two lower arms of the articulator, and, after sectioning, can be manipulated exactly as the fragments in the mouth; the sections of the

model swinging on their individual condylar arms in the same way that the fragments in the mouth swing on the natural condyles (Fig. 50). When proper adjustment has been made, fix the sections in position with additional plaster.

CAST JACKETS

Cover the model with No. 40 tin-foil, burnishing it well into the occlusal irregularities and the approximal embrasures (Fig. 51). Lubricate the tin-foil with glycerine or green soap and adapt a wax pattern of the jacket, using two

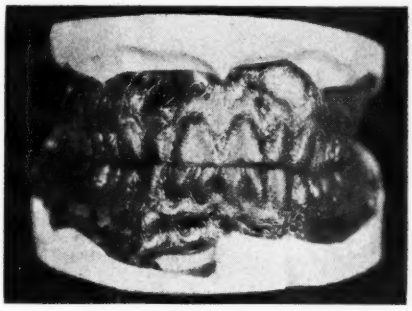

Fig. 51.—The models are coated with tin-foil.

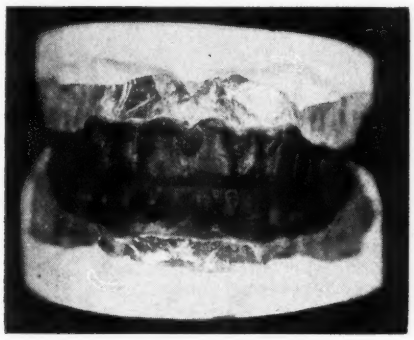

Fig. 52.—Wax patterns are adapted, overlapping the gingival margins 2 mm. and pressed well into the embrasures.

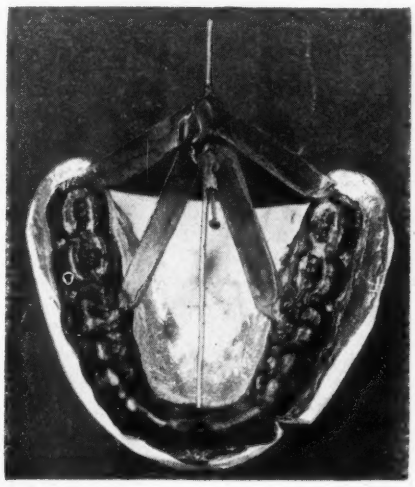

Fig. 53.—Sprues are attached for a centrifugal machine.

thicknesses of 28 gauge casting wax. Take care not to leave thin places over the cusps of the teeth, and press the wax well into the embrasures. Trim the periphery to overlap the gingival margin 2 to 3 mm. at all points, avoiding a notched margin that would catch débris (Fig. 52).

The extension of the marginal flange over the gingivae is important, as this extension protects these tissues, and maintains a state of hygiene and health markedly superior to that which exists when the jacket margin is notched carefully to fit the exact cervical border.

Small holes may be perforated through the occlusal surface of the pattern at the tips of the canines and second molar cusps, for the double purpose of

enabling the operator to know when the splint is properly seated when cementing, and also to facilitate removal.

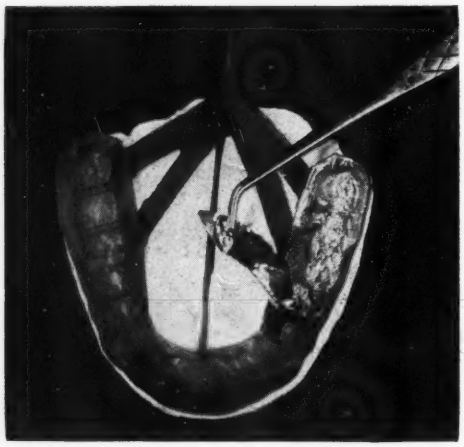

Fig. 54.—After the occlusal surfaces of the pattern and the sprues are painted with investment, it is lifted off of the model and the tin-foil stripped out. The central sprue wire forms a convenient handle and a support on the crucible-former.

Fig. 55.—The patterns are invested and cast, using an 80 per cent silver-copper alloy.

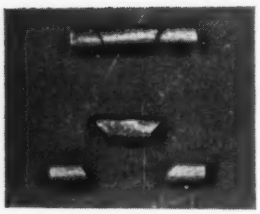

Fig. 56.—A three-quarter inch piece of 8x12 gauge tubing is cut into three sections.

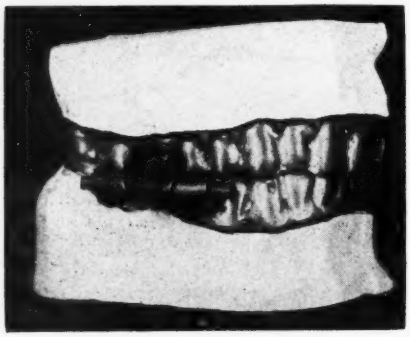

Fig. 57.—The center section of the tubing is waxed to one jacket, and the end sections are waxed to the other jacket.

Attach sprues according to the type of casting machine to be used. For a centrifugal machine, use one 12 gauge wire sprue attached at the lingual border in the median line, and two sprues on each side made of base plate wax,

one-fourth inch wide, attached at the lingual cusps on the first molars and at the posterior borders (Fig. 53). Paint the occlusal surface, the lingual surface, and the sprues with casting investment. When this investment is hard remove the pattern from the model, strip out the tin-foil (Fig. 54), invest and cast, using an alloy of 80 per cent silver and 20 per cent copper. Two ounces is sufficient to cast both upper and lower jackets (Fig. 55).

Adapt the castings to the models and correct the occlusion.

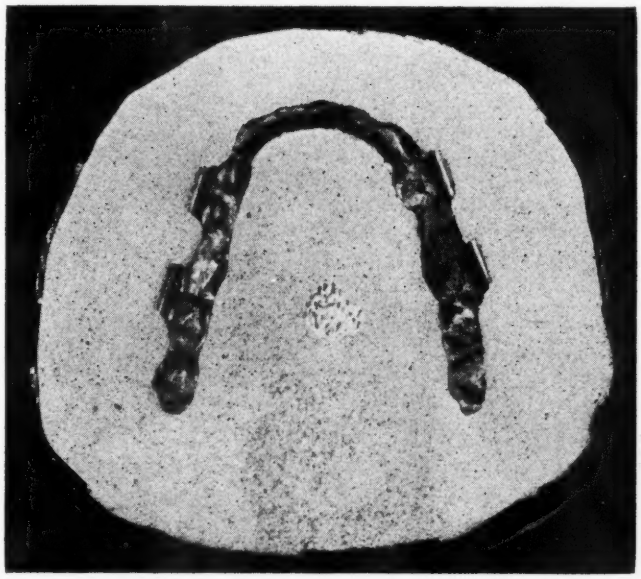

Fig. 58.—The splint-jacket is invested in a shallow ring and the investment trimmed to expose the joints on both upper and lower surfaces, to facilitate soldering.

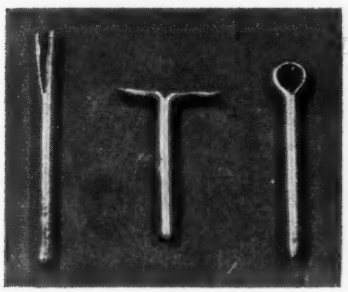

Fig. 59.—The split ends of a piece of 12 gauge wire are formed into a loop to make the lock-pin.

LOCK-PINS AND TUBES

Prepare the lock-tubes by cutting a piece of 8 x 12 gauge round nickel-silver tubing, three-fourths inch long, into three parts, the center piece being trapezoidal in shape, cutting at an angle of 60° (Fig. 56). Slip these three pieces on a piece of 12 gauge wire and fit them snugly in the crevice between the upper and lower jackets in the buccal region. Attach the end pieces to one jacket and the center piece to the other jacket with sticky wax (Fig. 57). Repeat on the opposite side, withdraw the wires, open the articulator, remove the jackets and fill in the crevices between the tubes and the jackets with additional wax. Invest in a metal ring, using a flat mass of in-

vestment in order to be able to expose the joint to be soldered from both sides (Fig. 58). Solder with either silver solder or 16 karat gold solder.

Form the lock-pin by sawing a half-inch slit in the end of a piece of 12 gauge wire, bending the two parts outward to form a loop, and join the tips with solder. Point the other end of the pin to facilitate its insertion (Fig. 59).

EXTRAORAL ARMS

Kingsley extraoral arms are attached to cast maxillary jackets in the following manner: Solder pieces of oval tubing, 5 x 8 gauge (inside diameters) and 1 inch long, to the buccal surfaces of the splint. Contour a piece 5 x 8 gauge hard nickel silver wire to fit into this tube, bending the wire so that it will emerge from the mouth 4 mm. from the commissure of the lips, indenting the upper lip rather than the lower to avoid drooling, and then pass backward parallel to the cheek, terminating in a loop one-half inch posterior to and below the ear (Figs. 60 and 61). Solder loops to these arms for the retention of the head straps, using soft solder for this purpose to avoid annealing the wire, and placing them so that the center of resistance of the splint and bone to be retained comes within the quadrilateral formed by the four loops.

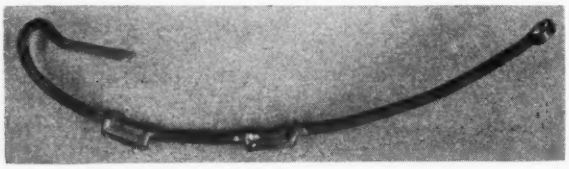

Fig. 60.—The extraoral arm has two wire loops, attached with soft solder, for the head-straps, and is split to form a loop at the posterior end for the tape around the back of the neck.

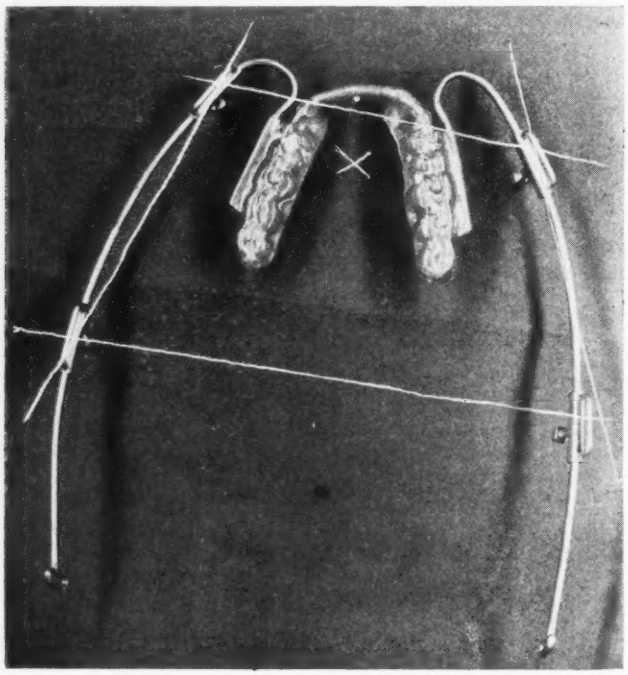

Fig. 61.—The loops are placed on the arms to form a quadrilateral which will enclose the center of resistance of the splint. The loops may be made adjustable as shown.

These loops may be made adjustable if desired by soldering them to a short piece of tubing which fits the wire arm, and adding a set screw to the tube to fix it in position.

SADDLES

Vulcanite saddles for edentulous fragments are made in the same manner as a denture, with the exception that they are provided with a flexible rubber lining and periphery. After waxing up the pattern to the desired contour, and including in it any lock-tubes or bars needed, it is placed in the lower half of the flask, and the plaster carried to a line approximately 3 or 4 mm. above the periphery, or to the height of the soft rubber margin desired. After completing the flasking and separating, vulcanite rubber is packed in the upper

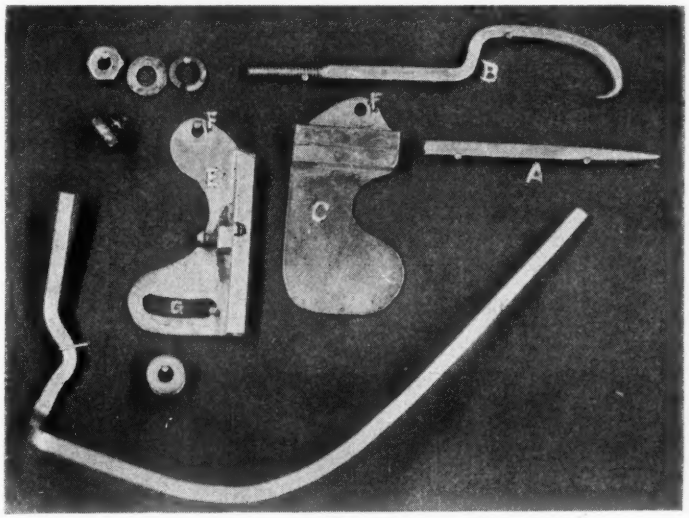

Fig. 62.—Showing the detailed construction of the author's "Micro-tongs" for the control of edentulous posterior fragments.

half, and velum rubber packed in the lower half without excess. This method secures a rounded border of soft rubber, without trimming, and places the excess on the hard vulcanite portion where it may readily be trimmed and polished.

MICRO-TONGS

The author's appliances for the control of an edentulous posterior fragment in a Class II fracture of the mandible (Fig. 62) consists of a fixed steel point "A" and an adjustable point "B," fitted in square tubing which is attached transversely on the base "C." The extraoral arm fits into a tube on a cast jacket on the anterior fragment, and, emerging from the mouth, passes around parallel to the cheek and engages a tube "D" which is attached longitudinally to the base "E." A set screw in this tube permits adjustment of the anteroposterior position of the tongs. The two bases C and E are attached by a bolt at one point "F," and the curved slot "G" permits a lateral rotary adjustment of the tongs. The swiveling motion as the fragment is forced backward would take place between the points and the bone, and further adjustments may be made by bending the extraoral arm.

This appliance is still in the experimental stage, and improvements in design may be expected, but it is believed that it presents a solution of this most difficult problem.

VULCANITE SPLINTS

Vulcanite splints for Class III fractures of the mandible are constructed exactly as full lower dentures with the exception that solid vulcanite blocks replace the premolar and the molar teeth. The occlusal surfaces of these blocks should be provided with sufficient imprints of the occlusal surfaces of

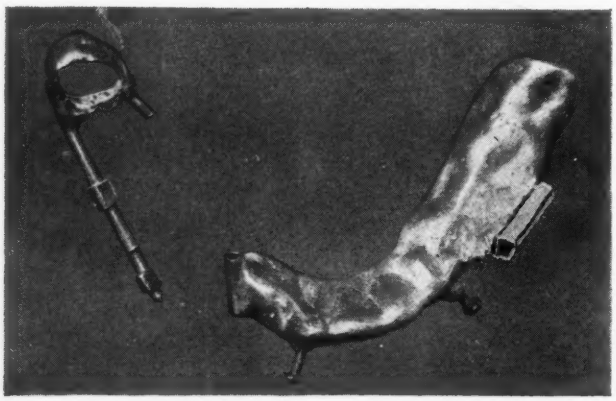

Fig. 63.—A threaded wire, passing through a tube, and provided with a nut on each side of the tube, may be used either as a jack-screw or as a traction-screw.

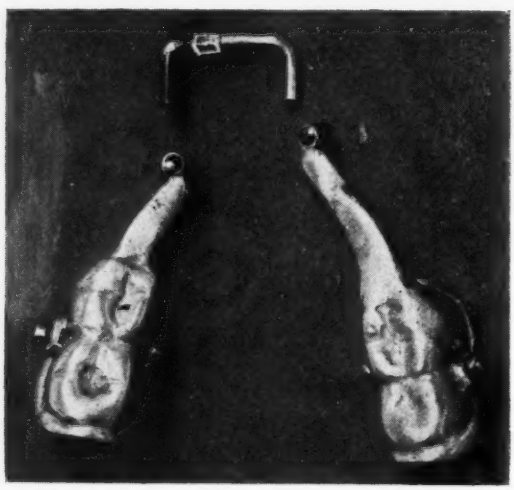

Fig. 64.—A threaded wire provided with a nut and engaging into a tube forms the simplest type of jack-screw. Angle extensions engaging tubes on the splint jackets furnish the swivel action necessary to compensate for the change in angle of the fragments during the process of reduction.

the maxillary teeth to prevent any lateral displacement of the splint. In the anterior region the splint can be made quite thin, thus leaving an ample orifice for feeding.

For Class III fractures of the maxilla, a similar pseudodenture should be constructed, with the addition of tubes for the reception of the Kingsley extra-oral arms. These tubes must be provided with strong anchorage lugs to insure their retention in the vulcanite.

It is not believed that velum rubber lining is of any service in either of the above Class III splints.

JACK-SCREWS

The illustrations (Fig. 63 and 64) show the construction of jack-screws and traction-screws with sufficient clearness to obviate the necessity of detailed description. The principle shown may be adapted to many types of gradual reduction appliances.

Fig. 65 illustrates the construction of the maxillary lock-tubes, when fracture bands are used instead of a cast silver jacket, in cases requiring only slight intermaxillary anchorage.

MATERIALS

The following materials, which may be secured from dealers in orthodontic supplies, in addition to those commonly found in the dental office, are sufficient to fill practically all requirements in the construction of fracture splints:

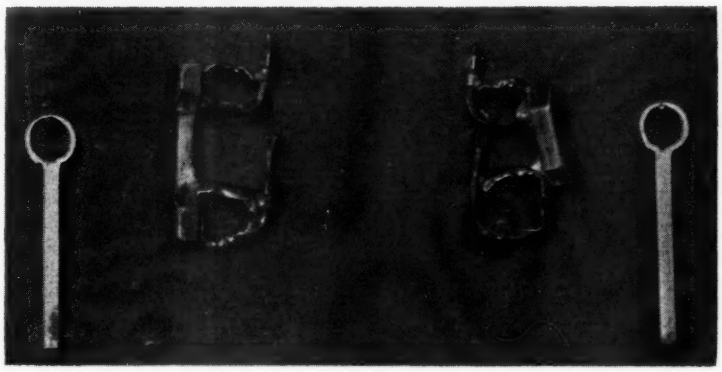

Fig. 65.—Intermaxillary anchorage may be furnished by fracture bands on upper first premolars and first molars connected by bars to which the lock-tubes are attached.

Nickel-silver orthodontic material; in one foot lengths:
Wire, round, gauges 12, 14, 16.
Tubing, round, gauges 8 x 12, 10 x 14, 11 x 16.
Wire, square, gauges 8, 10, 12, 14.
Tubing, square, gauges 5 x 8, 8 x 12, 10 x 14.
Wire, oval, gauge 5 x 8.
Tubing, oval, gauge 5 x 8 (inside diameters).
Nickel tubing for nuts, square with round hole:
Gauge 13, inside, for 12 gauge wire.
Gauge 15, inside, for 14 gauge wire.
Gauge 17, inside, for 16 gauge wire.
Taps and dies for 16 gauge wire (0.051) 66 threads, right hand.
Taps and dies for 14 gauge wire (0.064) 81 threads, right hand.
Taps and dies for 12 gauge wire (0.081) 81 threads, right hand.

Casting Material

For casting the jackets use an alloy of 80 per cent silver and 20 per cent copper. Two ounces will cast both upper and lower jackets for a splint.

Silver coins are 90 per cent silver and 10 per cent copper. To make 80 per cent alloy add to each dollar in coin one copper penny. $2.00 in coin is ample for both upper and lower jackets.

Sterling silver scrap purchased from jewelers is 0.925 silver and 0.075 copper. To each ounce of sterling silver add 3 dwts. of copper to make 80 per cent alloy.

GOLD PLATING TECHNIC

Solution. Dissolve 30 grains of gold chloride in 8 ounces of distilled water. Slowly add small lumps of potassium cyanide, stirring constantly until the solution clears. The solution is then ready for use. For electric current use three fresh dry cells, or two wet cells, producing from 4 to 6 volts.

Plating. Scrub the work thoroughly with soap and sodium bicarbonate to remove all grease, and do not touch it with the fingers thereafter. Connect a 3 dwt. piece of 24 karat gold (the anode) to the positive terminal of the battery. Place the jar containing the solution in a pan of warm water and maintain the temperature at about 120° F. Attach the work (the cathode) to the negative terminal of the batteries, using bare copper wire as before, and immerse both the work and the anode in the solution. Do not allow them to touch, and do not allow the wire which attaches the anode to enter the solution. When the work turns dark brown, which should be in about three minutes, remove, wash with the soap and soda mixture, rinse and return to the plating bath for further deposition. Three coatings are sufficient for a splint. If the plating is too rapid the current is too strong, and vice versa.

The gold plating will soon be worn off of those surfaces which are exposed to the friction of a tooth-brush, but in the crevices and on those surfaces which are out of reach it will prevent the accumulation of some of the débris, and will last as long as most splints are worn.

TECHNIC OF REMOVAL

Splint jackets may be easily and painlessly removed by means of band-removing pliers. One beak of the pliers is engaged at the cervical margin of the splint, while the other beak rests on the occlusal surface. Pressure or gripping with the pliers in this position, without any effort toward bending or prying, tends to spring or bow the facial flange of the splint, and thus break up the cement attachment. Repeating at close intervals around the splint will usually loosen it completely.

Direct force may be applied by placing one beak of the pliers under the cervical border of the splint, and the other beak on the cusp of a tooth, through a hole in the occlusal surface of the splint, either drilled at the time, or provided for the purpose when the splint was constructed.

Only rarely will it be necessary to split the labial flange of the jacket in order to assist the above procedures.

(To be continued.)

Note.—This the third of a series of articles by Captain Bodine. The next will appear in an early issue.

RHINOSCLEROMA*

FREDERICK A. FIGI, M.D., AND LUTHER THOMPSON, PH.D., ROCHESTER, MINN.

THE recent examination of three cases of rhinoscleroma in the Mayo Clinic within a period of four and a half months stimulated interest in this subject and led to the bacteriologic studies reported herewith. The observation of three cases in this period is unusual, in view of the extreme rarity of the disease in North America, and in a way tends to be misleading since only six proved cases of rhinoscleroma have been examined in the clinic during the last eight and a half years. Included in the first group is probably the only case of this disease in a native-born American, diagnosed during life. This patient, a young man of Slavic parentage, has never been outside the United States. One case in this group was previously reported by New.[1]

Rhinoscleroma, or, more properly, scleroma, is a chronic infectious granuloma. It was first recognized as a clinical entity by Hebra[2] in 1870, but the causative organism, Frisch's[3] bacillus, was not discovered until twelve years later. Since then a great deal has been written on the subject, especially by Europeans, although a number of excellent articles have appeared by American writers, among whom Toeplitz and Kreuder,[4] Freeman,[5] Mayer,[6] Güntzer,[7] and Watkins[8] are outstanding. The wealth of clinical data with regard to this disease in central and southeastern Europe stands out in contrast to the occasional report of an isolated case in this country. The infection is most common among the lower classes of Poles, Russians and Austrians, being endemic in their respective countries. It occurs sporadically in all the remaining central and southern European countries as well as those of southern and eastern Asia, northern Africa, Australia and North and South America. Lasagna[9] observed that the infection in Italy is apparently becoming more common and more virulent. Castellani[10] stated that rhinoscleroma is extremely rare in the tropics with the exception of Guatemala. As early as 1895, twenty-three cases, most of them among natives, had been reported in Central America. According to Freeman, the few cases in England and France before 1900 were all among foreigners. Mayer reviewed all the cases (sixteen) reported in North America up to 1908. He noted that all of the patients had come from some part of Poland and that the infection had begun before the patient came to this country. An authentic case had not originated in the United States up to that time. In fact, Watkins in 1921, reported a case of primary scleroma of the larynx in a negro born in Maryland, and stated that all authentic cases of scleroma of the upper respiratory tract occurring in this country were among immigrants from Europe, and that the disease had been encountered only

*From the Section on Laryngology, Oral and Plastic, and the Section on Clinical Pathology, Mayo Clinic.

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twice in approximately 1,500,000 patients treated in the wards and the outpatient department of the Johns Hopkins Hospital during the last thirty years. Two of the six patients with rhinoscleroma seen in the clinic were Austrians, two were Roumanians, and one was a native of southern Germany who had spent some time in Russia. The sixth patient, as previously stated, was a native-born American of Slavic parentage.

Scleroma is intimately associated with lack of hygienic surroundings. One writer refers to it as a disease of the "great unwashed." In countries where it occurs endemically it is more widespread in the rural districts and is confined to areas in which it already exists. The contagious nature of the infection is indicated by Lasagna's report of fifteen Italians with the disease, nearly all members of one family living in the same house. Other instances of the infection in more than one member of the same family have been reported in two sisters by Robertson,[11] in two brothers by Secretan,[11] and in two sisters by Gerber[12] (Mayer suggests that the latter may be the same cases mentioned by Streit[11]). None of our patients knew definitely of having come in contact with the disease prior to the infection.

As a rule scleroma is somewhat more common in females than in males. In the 100 cases reported by Baurowicz,[13] forty-three were males and fifty-seven were females. In Gerber's group six were females and four were males. In the sixteen cases occurring in North America up to 1908, thirteen were females and three were males. Our six patients were all males.

The disease occurs chiefly in early adult life, although occasionally a patient beyond the fourth and even the fifth decade is mentioned in the literature; very few reports of patients in the first decade have been noted. Mayer mentions that Freudenthal[14] treated a patient aged 9 years. In Rydygier's[15] group of fourteen cases, thirteen were girls between 7 and 20. In Baurowicz's series of 100 cases, only thirteen were beyond the fourth decade. His oldest patient was aged 63; the average age was 25.7 years. Our patients ranged from 26 to 35 years, averaging 29½ years.

GROSS PATHOLOGY

The gross pathologic changes of scleroma vary with the stage of the disease in which the patient presents himself for examination. The name "rhinoscleroma," originally given the disease by Hebra, should be modified since in a large proportion of cases the infection is by no means confined to the nose. "Rhinopharyngoscleroma" has been suggested by Kobner,[16] and "scleroma respiratorium" by Wolkowitsch and Bornhauft.[16] The term scleroma is rightly coming into general use. The infection usually starts in the mucous membrane of the anterior nares and the first changes are accordingly found here. The process may remain in this area or it may gradually spread onto the upper lip and external nose or back into the nasopharynx, oropharynx, larynx or trachea. On the other hand, any of these areas may be primarily involved; the lacrimal ducts, eustachian tubes, hard and soft palates, and even the bronchi may be involved secondarily. The involvement is usually bilateral. The lesions at first appear as edematous, bluish red, discrete

nodules. These may form a large, ulcerated, granulomatous mass protruding from the nostrils and involving the upper lip. A foul discharge is emitted and the entire picture often strongly suggests active sarcoma. The nodules later become hard and lighter in color. If they are confined to the mucous membrane they do not tend to ulcerate unless traumatized. Sometimes the infiltrative process involving the palate will enlarge the alveolar arch and cause the teeth to stand apart. This was observed in one of our cases (Fig. 1).

The infiltrative and hyperplastic process, resulting in the gross changes mentioned, later gives way to a sclerosing process and the mucous membrane becomes scarred and atrophic. Concentric stenosis of the nasopharynx with retraction or destruction of the uvula is commonly present, and this should

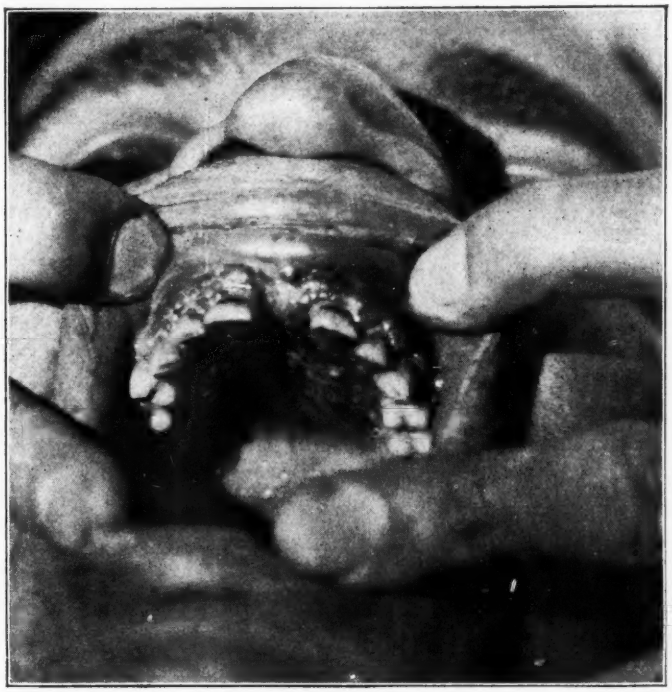

Fig. 1.—Scleroma of upper jaw.

suggest the possibility of scleroma (Fig. 2). In one of the cases reported here the epiglottis was drawn down like a trapdoor, completely concealing the stenosed glottis; its free border was in contact with the posterior wall of the hypopharynx (Fig. 3). There may be extensive scarring and deformity of the external part of the nose, although bone and cartilage, as a rule, are not destroyed.

A great difference has been noted in the number of cases of external nasal deformity in cases reported by various writers. In eighty-seven cases reported by Wolkowitsch[16] there were only four in which the nose was normal externally, while in Juffings'[15] series of thirty-eight cases the deformity was present in only four. Gerber ascribed this to a difference in the virulence of the infection and to the geographic distribution. In two of our cases there was external nasal deformity. In one of these there was loss of the columella and free

border of the alae, with collapse of the lower portion of the nose, producing a deformity similar to that seen sometimes in tertiary syphilis (Fig. 4). Metastasis to the regional lymph nodes has been reported by several writers, but its occurrence is denied by others.

HISTOLOGIC PATHOLOGY

The histologic pathology of the disease, although not entirely characteristic, is of value in establishing the diagnosis. The most striking microscopic observation is the large vacuolated "Mikulicz,"[17] "foam" or "lace" cell, often of a diameter from fifteen to twenty times that of a red blood cell and usually containing one or more nuclei. Since they furnish a good culture medium,

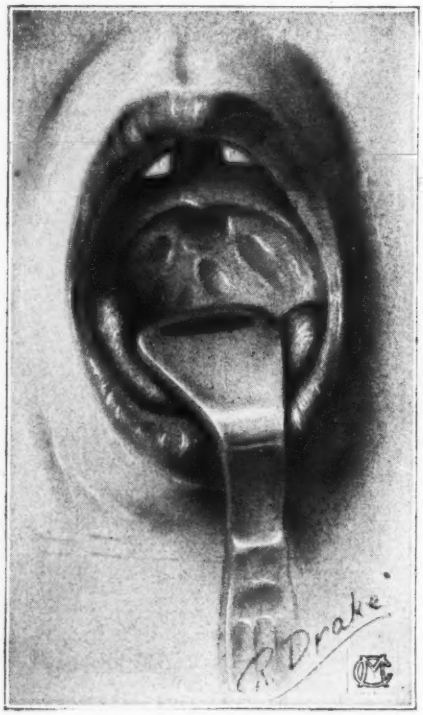

Fig. 2.—Scarring of pharynx and destruction of uvula from rhinoscleroma.

great numbers of Frisch's bacillus are often found within them (Fig. 5). These cells are most often seen just below the epithelium and are most numerous in the oldest lesions. They are supposed to be degenerative or hydropsic forms of mononuclear leukocytes. Contrary to common belief they are not pathognomonic for rhinoscleroma but, as Dittrich[15] has pointed out, are also found in cases of lepra, glanders and bubonic plague. Mibelli[15] states that they occur in the granulation tissue of wounds, in areas of malignant edema and other inflammatory edemas and in acutely inflamed sweat glands. Another microscopic element seen in scleroma is the so-called Russell body or hyaline body of Unna. These are from 20 to 40 microns in diameter, stain deeply with acid dyes and are scattered throughout the microscopic section. Bacilli are never found within them. Nothing is known of their significance.

SYMPTOMS

Scleroma always runs an extremely chronic course. It may continue for from fifteen to thirty years and then gradually subside spontaneously. The duration of the symptoms of patients prior to their coming to the Mayo Clinic varied from one to eight years, averaging four and a half years. The early development is often so insidious that the exact date of onset cannot be de-

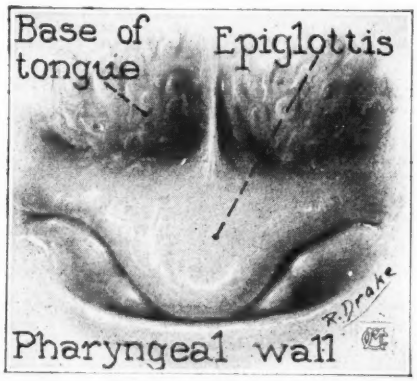

Fig. 3.—Retraction of epiglottis over stenosed larynx.

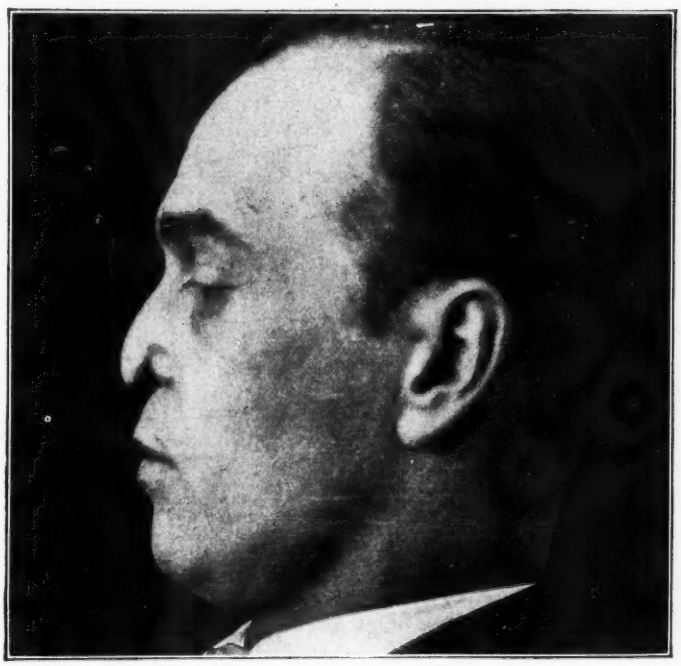

Fig. 4.—Nasal deformity from rhinoscleroma with loss of columella.

termined. Occasionally there is a history of preceding trauma and at times this seems to bear a definite relationship, but Güntzer suggests that the disease probably is present before the injury. One of our patients was kicked in the face by a horse, and a week subsequently nasal obstruction and a profuse watery discharge from the nose appeared. Often acute rhinitis is the first evidence of trouble. Symptoms of catarrhal inflammation of the mucous membrane of the upper respiratory passages with tenacious fetid discharge follow,

and crusting, hoarseness and dyspnea develop later. A tumor within the nostrils producing obstruction, bleeding readily, broadening the nose and later extending down onto the upper lip or into the pharynx is the sequence noted in many cases. As a rule, there is little pain associated with the disease, although local soreness is complained of and at times some aching. When the disease is primary in the larynx or trachea, hoarseness, coughing and dyspnea develop early. In this group of cases, the involvement is usually subglottic primarily. The process may remain confined to the area of primary involvement for years before it spreads from the nose to the pharynx and larynx or vice versa.

DIAGNOSIS

A diagnosis of scleroma based on the history or clinical data alone is not justifiable, although Juffinger claimed to be able to diagnose the disease from the odor alone. The clinical picture may be simulated by a number of diseases,

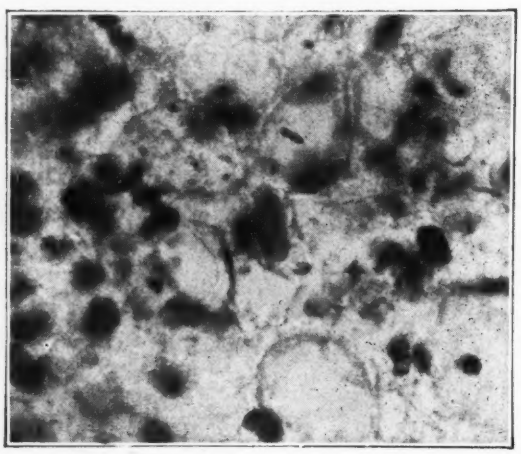

Fig. 5.—Large Mikulicz cells with intracellular diplococci; x1000.

among them syphilis, leprosy, lupus, atrophic rhinitis, pharyngitis and laryngitis with ozena, sarcoma and carcinoma. Culture of the discharge and biopsy afford the only means of confirming the clinical diagnosis. It is more satisfactory to make cultures from a bit of the crushed tissue than from direct smears of the discharge. The nationality of the patient is a helpful clue. Soukup[18] recently reported encouraging results in cutireactions in the diagnosis of rhinoscleroma.

TREATMENT

The treatment of scleroma has, until comparatively recently, been notoriously unsatisfactory. Prior to the demonstration by Fittig[19] in 1903, and by Schein,[15] Mayer, Pollitzer[20] and others[21] subsequently, of the value of the roentgen rays as a therapeutic agent in this disease it was considered incurable. Brunner[22] and Jakobowsky[22] in 1915 reviewed the results of treatment with mercury, arsenic, iodine, arsphenamine, tuberculin, local applications of caustic and the actual cautery, and concluded that not one was of benefit. They found vaccine to be of definite value in treating early cases and in preventing spread

of the disease, but it had no effect on the sclerotic areas. Lasagna found that autogenous vaccine did not afford good results even in large doses, and concluded that even the most modern forms of treatment neither improve nor arrest the scleroma. Severe febrile reactions are said to have a beneficial effect. Freudenthal cited a case reported by Lubiner[23] from Heryng's clinic in which the scleromatous process entirely cleared following an attack of typhus fever. Improvement after an attack of erysipelas has been observed in a number of instances. Pean[24] reported a case of complete cure in which the diseased tissue was removed surgically and areas that showed any tendency to recur were cauterized.

All the patients observed in the Mayo Clinic had received some treatment previously. In most instances, however, a diagnosis had not been established and therapeutic measures had been rather haphazard. All cases were treated by radium in the clinic, the application being made externally over the affected areas and also in direct contact with the diseased tissue. Externally, the radium was used at a distance of 2.5 cm. with 2 mm. of lead screening, a

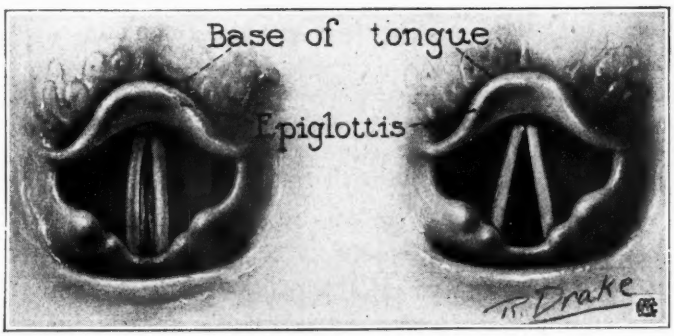

Fig. 6.—Subglottic thickening from rhinoscleroma and appearance after radium treatment.

total of from 3,000 to 5,000 milligram hours being administered. The applications directly to the tissue were made with the unscreened 25 mg. plaque or bare brass emanation tubes, from 50 to 150 milligram hours being given over each area. The applications were repeated at intervals of from a month to six weeks, depending on the progress. If the larynx was involved, radium was given externally and also by means of a long metal applicator directly into the glottis, the throat being cocainized and the application being observed in the laryngeal mirror. A potassium iodide preparation was given internally to help take care of the tenacious, fetid discharge, and the galvanic cautery was used occasionally in destroying localized, indolent nodules in the pharynx.

RESULTS

As the result of the foregoing treatment, three patients are free from any clinical evidence of the disease. One of these has been without sign of trouble for more than five years. The remaining two patients have been under observation and treatment for only about a year. Both had laryngeal involvement on admission; the larynx of one was so completely obstructed that an emergency tracheotomy was necessary (Fig. 6). The fourth patient had been

given intensive treatment with antimony prior to coming to the clinic, but the process had gradually progressed in spite of this. The disease had been present for eight years and was well advanced. The external nasal deformity, stenosis of the nostrils, nasopharynx and larynx, and the distortion of the epiglottis were marked. The process was still active in these areas and, when the trachea was opened to relieve the respiratory obstruction, active involvement of the tracheal wall was noted. This patient also is greatly improved at the present time. He is still wearing his tracheotomy tube, but the laryngeal stenosis is much less severe. As yet no dilatation has been carried out. The remaining two of the six patients examined in the clinic disappeared from observation following one and two radium treatments, respectively. It has since been learned that one of these died from the scleromatous process. The other was reported by his home physician to be greatly improved at the end of about two years. In neither of these did the infection appear more extensive than that of some of the patients who are now either much improved or entirely free from evidence of the disease. The patient reported to have died from the disease had complained of a sense of tightness in the chest at the time of examination in the clinic and had lost 25 pounds (11.3 Kg.) within three years. Bronchial involvement may have been present then, although it was not apparent.

PROGNOSIS

The prognosis in scleroma varies with the stage at which the disease comes under treatment and with the extent of the involvement. From our limited experience we feel that, if the infection is confined to the nose or pharynx, the outlook should be encouraging. If the process involves the larynx and upper portion of the trachea, the prognosis is less favorable; yet, judging from the progress in the cases in this series, it would seem that with persistent treatment many of these patients might recover entirely. The length of time required to eradicate the disease naturally varies with the stage at the time of beginning treatment, the sclerotic tissues responding much more slowly.

REPORT OF CASES

CASE 1.—A laborer, aged 32, residing in Manitoba and born in Austria, registered at the Mayo Clinic, April 7, 1919, with the complaint chiefly of hoarseness and cough of three years' duration. Four years previously dyspnea on exertion, sore throat and a sense of fullness in the throat had developed. He had lost 25 pounds (11.3 Kg.) during the last three years. A good deal of treatment had been given locally, internally and intravenously.

Examination disclosed thick crusting in the nose; injection and scarring of the pharynx; retraction of the soft palate posteriorly and upward; concentric stenosis of the nasopharynx; scarring of the anterior commissure; granuloma of the false cords, and thickening in the subglottic region with narrowing of the trachea. A diagnosis of syphilis was made clinically, and of rhinoscleroma from biopsy.

Two external applications of radium were made outside the larynx. Following this the patient disappeared from observation and died five and a half years later, probably from extension of the granulomatous process.

CASE 2.—A farmer, aged 27, residing in Alberta, Canada, a native of Russia, registered at the Mayo Clinic, April 4, 1921, with the complaint that he had been kicked in the face

by a horse a year previously and a week later noticed increasing soreness and enlargement of the nose; this continued for about six months, when the nose became completely obstructed.

On examination the obstruction was found to be due to an ulcerated tumor involving the margins of the meatuses and filling the nasal fossae and nasopharynx. The soft palate was retracted posteriorly and upward. A profuse fetid mucopus was being discharged from the nose. Rhinoscleroma was suspected from the clinical picture; the diagnosis was confirmed by biopsy and culture.

Two applications of radium (200 to 400 milligram hours) were made directly into both nostrils and into the nasopharynx at intervals of about a month. For more than six years there have been no signs of infection.

CASE 3.—A laborer, aged 27, residing in Manitoba and a native of Roumania, registered, Jan. 28, 1922, with the complaint of a hard nodule that had been first noticed in the left nostril four and a half years previously. This enlarged gradually and was excised after about six months. It recurred promptly, and the anterior hard palate and superior alveolar process became enlarged. The growth was again excised, and there was prompt recurrence. Several months before admission four radium treatments had been given without much improvement.

Examination disclosed scarring of the nose downward and to the right; a small perforation of the right ala, probably due to irradiation; a large perforation of the septum; bulging to the left of the bridge of the nose; a moderately soft, nonulcerated mass involving the upper alveolar process and hard palate anteriorly; a granuloma extending down the right lateral wall of the nasopharynx and oropharynx; the pharynx injected and atrophic with a good deal of tenacious, fetid mucus, and the soft palate retracted and elevated. Rhinoscleroma was diagnosed clinically, and confirmed by biopsy and culture.

One application of radium was given in the clinic and two applications were given after the patient reached his home. The local physician reported much improvement following the last treatment. We have an unconfirmed report of the patient's death, cause unknown.

CASE 4.—A farmer, aged 35, from Alberta, Canada, a native of Roumania, registered, Dec. 2, 1926, with the complaint that he had been hoarse for five years, but that this had been more troublesome for the last three years. He had been dyspneic for four months and had lost 30 pounds (13.6 Kg.) during this time. A diagnosis of catarrh had been made.

Examination disclosed atrophic mucous membrane of the nose, nasopharynx, pharynx and larynx with marked crusting, thickening of the vocal cords, and limited abduction (50 per cent). Rhinoscleroma was suspected from the clinical picture, and the diagnosis was confirmed by culture and biopsy from the false cords.

A potassium iodide mixture was given by mouth. The patient refused to have tracheotomy performed at this time, but returned in a serious condition from respiratory obstruction and emergency tracheotomy was performed, Feb. 12, 1927. Two external applications of radium were made at intervals of six weeks; the radium was applied directly to the glottis once (178 milligram hours). When the patient was last seen, April 8, the laryngeal condition was greatly improved, the cord movements being quite normal and breathing space at least twice what it was prior to treatment.

CASE 5.—A bookkeeper, aged 26, residing and born in New Jersey, who had never been outside the United States, came to the clinic, Feb. 17, 1927, complaining of nasal discharge and deformity, sore throat, hoarseness and dyspnea. Eight years previously, foul nasal discharge with crusting and occasional epistaxis developed. Hoarseness had been progressive for the last two years but had been much worse for three months, and dyspnea was associated. The patient had lost 30 pounds (13.6 Kg.) in three years. A diagnosis of rhinoscleroma had been made elsewhere and twenty-five intravenous injections had been given.

Examination disclosed an extensive, destructive lesion of the nose, pharynx and larynx; loss of the columella and a portion of the left ala and tip of the nose, the tip being drawn down in contact with the upper lip; external part of the nose extremely hard; profuse fetid discharge; marked stenosis of both vestibules; extensive scarring of the pharynx with loss of the uvula and concentric stenosis of the nasopharynx; epiglottis firmly retracted over the stenosed larynx, and active ulceration in the nose, nasopharynx and pharynx. A tentative diagnosis of rhinoscleroma was made from the history and clinical data; the diagnosis was confirmed by biopsy and culture.

Tracheotomy showed active involvement of the tracheal wall when the trachea was opened at a level of the second cartilaginous ring. Radium was applied on several occasions, at intervals of from one month to six weeks externally over the nose, larynx and trachea and directly into the nostrils, pharynx and larynx. A potassium iodide mixture was given internally and autogenous vaccine subcutaneously. Improvement in the general condition and local lesion was striking. The patient has gained 30 pounds (13.6 Kg.) since treatment was started. The ulcerations of the nose, nasopharynx and pharynx are healed. The induration of the nose is greatly lessened. The patient breathes readily with the tracheal tube corked. The voice is much improved.

Case 6.—A man, a cook, aged 30, a resident of Minneapolis, born in Galicia, came to the clinic, April 18, 1927, on account of hoarseness which had developed following a "cold" four and a half years previously. He had been moderately dyspneic the first two years. "Laryngeal trouble" had been diagnosed and radium and roentgen-ray treatment had given some relief. Crusting in the nose with nasal obstruction and hoarseness had persisted.

Examination disclosed diffuse thickening of the nasal mucous membrane with crusting; firm, nodular, nonulcerated lesion of the left posterior tonsillar pillar and similar lesions involving the anterior portion of both vocal cords; diffuse injection of the mucous membrane of entire nose and throat, and free tenacious and fetid mucoid discharge. A diagnosis was made of rhinoscleroma and confirmed by biopsy and culture.

Four external applications of radium varying from 3,000 to 4,000 milligram hours with distance and screening were given at intervals of from five to twelve weeks, chiefly over the larynx and upper portion of the trachea. Radium was also applied directly into the larynx and nose on one occasion and into the pharynx on two occasions. The actual cautery was also used inside the pharynx once. When the patient was last seen, November 18, there was no clinical evidence of the disease aside from crusting in the nose.

BACTERIOLOGIC DATA

A review of the recent literature on the cultural aspects of *Bacillus rhinoscleromatis* seems to show that most of the observations have been made on stock cultures, and on only a few of these. Consequently it was thought best to study three freshly isolated strains obtained from three of the foregoing cases.

The original studies by von Frisch consisted of culturing the organisms in sterile blood serum and aqueous humor of the eye in hanging-drop preparations. He also used the infusion gelatin which had been devised by Koch. His chief contribution was the demonstration of the organisms within the cells described by Mikulicz. Wilde,[25] in 1896, studied twenty-five cultures of various encapsulated organisms belonging to the genus, only one of which is mentioned as a strain of *Bacillus rhinoscleromatis* and that from a stock laboratory culture. This culture gave acid but did not give gas in dextrose broth and there was not any or very little acid in lactose; it failed to coagulate milk and did not give indole or gas on potato medium. Perkins, 26 in 1904, studied a culture of *Bacillus rhinoscleromatis* which did not give acid or gas in any sugar medium

used. In a report which was published in 1925 he[27] classified the encapsulated gram-negative bacilli in four groups and put *Bacillus rhinoscleromatis* in the fourth group (those that did not ferment carbohydrates). Fitzgerald,[28] in 1914, studied five stock strains which were obtained from various sources. The organisms in his cultures had lost their capsules, and one of the five strains liquefied gelatin. His results with carbohydrate fermentations were so variable that he does not consider them useful in identifying a species within the group of gram-negative encapsulated bacteria. In view of our experience it is easy to understand how formation of capsules and fermentation of carbohydrates may vary in cultures that have been kept for a considerable length of time on artificial mediums. Small and Julianelle,[29] in 1923, studied twenty-seven strains of organisms belonging to the genus, one of which was a stock strain of *Bacillus rhinoscleromatis.* This culture gave acid without gas in dextrose, levulose, galactose, lactose, maltose, rhamnose, arabinose, raffinose, xylose, adonitol, mannitol, glycerin, salicin and dextrin; neither acid nor gas was produced in saccharose, dulcitol, inulin and starch. In Bergey's[30] *Manual of Determinative Bacteriology,* the separation of this group of organisms is based on the fermentation of carbohydrates, and *Bacillus rhinoscleromatis* is listed as producing acid and gas in dextrose and sometimes in lactose.

From the preceding it appears that the carbohydrate fermentations of this organism have been variable in the hands of different investigators. The three cultures described here were isolated between December, 1926, and April, 1927. Three series of tests were made at intervals of about a month. A culture isolated in 1922, on which a complete study was not made, showed agreement in carbohydrate fermentations, so far as they were carried out. In the study of *Bacillus rhinoscleromatis* all mediums were adjusted to a hydrogen-ion concentration of approximately P_H 7.0.

Morphology.—When the organisms were grown in nutrient broth for twenty-four hours at 37° C. they appeared as nonmotile rods from 1.5 to 3 microns long by 1 micron wide with rounded ends and occurring singly or in pairs.

Stains.—The organisms were gram-negative and stained well with methylene blue (methylthionine chloride, U. S. P.). Spores were not demonstrated in either young or old cultures. Capsules were observed after twenty-four hours in cultures on nutrient agar slants; the capsules were easily demonstrated by fixation of the smear with glacial acetic acid, before it was entirely dry, followed by carbolfuchsin stain with heating. Many of the bacteria showed bipolar staining with gram's stain or with 2 per cent crystal violet in methyl alcohol after twenty-four hours' incubation at 37° C. in nutrient broth.

Gelatin Colonies.—In nutrient gelatin plates at room temperature (from 20° to 23° C.), visible growth was not observed after twenty-four hours. After three days small colonies (0.5 mm. in diameter) were observed which were compact and spherical or slightly irregular.

Gelatin Stab.—In stab cultures of nutrient gelatin incubated at from 20° to 23° C. there was a round nail-head appearance on the surface after three days' incubation; the growth in the stab was filiform. Liquefaction did not occur in thirty days. At 37° C., liquefaction did not occur in ten days.

Agar Colonies.—In cultures of nutrient agar incubated at 37° C., smooth, entire, round, convex, translucent and slimy colonies, 2 by 4 mm., were observed after one day. The deep colonies were lenticular and about 0.5 mm in diameter. After three days the colonies were opaque, whitish and slimy, and varied from entire to lobate.

Nutrient Broth.—In nutrient broth cultures incubated at 37° C., after one day there was moderate clouding, ring formation, and a small amount of sediment. After two days the appearance was unchanged except for a heavier ring and more sediment. After seven days the appearance was much the same; the ring persisted, and there was not a complete pellicle over the surface.

Dextrose Broth.—In dextrose broth cultures incubated at 37° C. there was moderate clouding after one day; there was neither ring formation nor pellicle. After two days the appearance was unchanged. After four days the appearance was still unchanged. The medium was acid to methyl red (hydrogen-ion concentration from P_H 5.0 to 5.2).

Litmus Milk.—In litmus milk cultures incubated at 37° C. there was slight acidity after one, two and three days. After six days the reaction was neutral. After twelve days the reaction was neutral; curd was not present; one of the three cultures showed slight reduction of litmus.

Potato.—In cultures on potato medium after one day there was a slight transparent growth. After three days the growth was slimy and spreading; the medium was slightly darkened. Growth may not appear on potato medium unless a fairly heavy inoculation is made.

Indole.—Tests for indole were negative by both the Ehrlich and Salkowski tests after four days' incubation at 37° C. in nutrient broth.

Nitrates.—Nitrates were reduced to nitrites.

Oxygen Requirements.—The organism grows better under aerobic conditions. It grows more slowly in a deep stab than on the surface. The best growth was observed at the surface of nutrient broth. Combined oxygen can be utilized in place of atmospheric oxygen, as evidenced by the absence of a ring in the dextrose broth cultures.

Optimal Temperature.—The optimal temperature of the organism is evidently at or near 37° C.

Sugar Fermentations.—Gas was not produced in any sugar. In the table are shown the results of tests for acid in thirteen sugar mediums. All of the tests were carried out in Durham type fermentation tubes. The mediums consisted of 0.5 per cent of the various sugars in nutrient broth adjusted to a hydrogen-ion concentration of P_H 7.0. Bromthymol blue (0.2 per cent alcoholic solution) was added as an indicator in the proportion of 1 c.c. for each 100 c.c. of medium.

The only irregularity noted in sugar fermentation was in raffinose. This sugar was acidified by all three cultures when tested in October, 1927, from six to ten months after their isolation, although three tests which had been done soon after the cultures were obtained did not show any effect on this sugar.

THE PRODUCTION OF ACID IN SUGAR MEDIUMS*

CULTURE FROM	DEXTROSE	MALTOSE	MANNITE	SACCHAROSE	LEVULOSE	GALACTOSE	XYLOSE	ARABINOSE	RHAMNOSE	INOSITE	SALICIN	GLYCEROL	TREHALOSE	INCUBATION DAYS
	DAYS BEFORE ACID APPEARED													
Case 4	1	1	1	9	1	1	1	1	1	4	1	4	2	10
Case 5	1	1	1	4	1	1	1	1	1	2	1	4	1	10
Case 6	1	1	1	4	1	1	1	1	1	2	1	9	2	10

*Acid was not produced by any of the cultures in lactose, inulin, raffinose, dulcitol and dextrin.

Since gas was not produced in the regular fermentation tubes, tests were made using unheated dextrose, levulose and galactose. The sugar solutions were sterilized by filtration and added to sterile nutrient agar in a proportion that gave the same percentage of sugar as was used in the broth tubes. Even small amounts of gas were not shown in agar stab cultures. It would seem that, as far as carbohydrate fermentation is concerned, the most important observation is the absence of gas production. When first isolated, these cultures were consistent in their action on the sugars as is shown in the table. It is probable that cultures which have been kept in stock for more than six months exhibit irregularities in their action on carbohydrates and that some of the confusion which exists in the literature may be due to the fact that few workers have had recently isolated cultures with which to work.

ABSTRACT OF DISCUSSION

DR. SHELTON WATKINS, Louisville, Ky.—Several years ago I saw a case of scleroma of the larynx and trachea. There was no evidence whatever of involvement of the upper respiratory tract. The patient was a negro, aged 21, born in Baltimore, who had not left the United States except on several short trips to South America. I believe that this is the first case reported in this country of scleroma in a native American, and, also, the only one so far recorded among us of scleroma primary in the larynx and trachea. The important points in the diagnosis were borne out; that is, extreme chronicity, absence of pain, absence of ulceration, the ivory hardness, and the typical microscopic picture, including Mikulicz's cells and the hyaline bodies of Unna. The first symptoms were present about three years before the patient was admitted to the hospital. There was no pain, either in the throat or referred from it. On examination no ulceration was seen. At autopsy the lesion was found to be chiefly below the vocal cords. The mucous membrane was grayish, irregular and much thickened, producing a marked constriction of the lumen. There was no ulceration. Also, the lesion was very hard and calcified in areas. The typical microscopic picture was found in a number of slides. The diagnosis was made by Dr. William Finney, of the pathologic department, and later was verified by Dr. William McCallum. Unfortunately, the true condition was not recognized during life, because soon after the patient entered the hospital he was found to have a 4-plus Wassermann reaction. Naturally, with a lesion like that and a positive Wassermann reaction we thought he had one of those rare cases of gumma of the larynx and trachea. Mercurial inunctions and the iodides increased the difficulty in breathing. We hesitated to give him arsphenamine treatment for fear it would produce the same result. He began to improve under rest and had much less difficulty in breathing. This misled us and we postponed a tracheotomy, which had been considered. Suddenly one night great distress in breathing developed rapidly and the patient died

within about four minutes, before the house officer could get to him. We made a mistake in not performing an early tracheotomy, which would have saved his life, and, very probably, enabled us to recognize the disease.

DR. FREDERICK A. FIGI, Rochester, Minn.—I was greatly interested in Dr. Watkins' case report at the time it appeared several years ago and appreciate his discussion of this paper. Dr. W. P. Finney, who did the autopsy and microscopic studies in Dr. Watkins' case, remarked on one occasion that although he made a diagnosis of rhinoscleroma in that case, he was not convinced that such a clinical entity existed. I feel that there is very little question regarding the existence of such an entity, as the clinical picture is very definite; the Frisch bacillus can be isolated in all cases; lesions simulating those seen in rhinoscleroma have been produced in experimental animals by the injection of the bacilli, and the organism has again been recovered from these lesions. In addition, the microscopic picture is constant, although not characteristic for this condition alone.

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CASE REPORT OF AN IMPACTED MAXILLARY THIRD MOLAR OPERATION

By Dr. M. Hillel Feldman, D.D.S., New York

IN THE accompanying illustrations, the writer presents a graphic story of a complication which is very prone to occur during an operation for the removal of an impacted maxillary third molar.

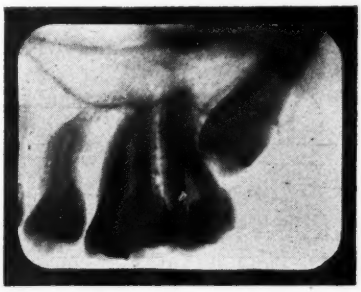

Fig. 1.—Impacted right third maxillary molar.

Fig. 2.—Impacted right maxillary third molar displaced toward spheno-maxillary space during the operation for its removal.

The small roentgen ray shows the position of the superior right third molar preliminary to the operation. (Fig. 1.) Nothing about it would indicate that there was any unusual thinness of bone buccally to the unerupted tooth. On operation, the tooth, with only the slightest amount of pressure with the elevator, slipped back to the region of the spheno-maxillary space. Fig. 2 shows the tooth distally located. A second roentgen ray examination, made after

Fig. 3.—Roentgenogram taken after operation.

the operation, is also submitted.. It was necessary to considerably enlarge the opening, and draw the tooth down with a long straight hemostatic forceps.

Sometimes, such teeth are, with only moderate application of force, sent upward into the maxillary sinus. This might occur if the root normally penetrated the sinus floor. In such eventuality the technic for its removal would involve making an opening in the canine fossa, rather than extracting the second molar to enlarge the opening as some have advocated.

FUNDAMENTAL PRINCIPLES TO KNOW CONCERNING NITROUS OXID AND OXYGEN*

By Edward L. Thompson, D.D.S., Daytona Beach, Florida

HORRACE WELLS in 1844 exclaimed, "A new era in tooth pulling." It is indeed singular that nitrous oxid, the anesthetic which Wells announced, should remain today as a prominent, if not the most important, anesthetic agent of dental surgery. The discovery of the advantages of oxygen for prolonging and controlling the depth of anesthesia, by Dr. Andrews, has made this anesthetic more universally used with a great degree of safety. Dr. John S. Lundy has added carbon dioxid for stimulation and control of respiration, which adds still further to the safety of this anesthetic.

To show how generally nitrous oxid oxygen is used for the extraction of teeth I shall quote a report from questionnaires sent out. These answers were from one hundred and thirty of the most prominent exodontists in this country. Five hundred thousand patients had been operated on. Replies to the questionnaires showed that 80 per cent of the 130 exodontists use nitrous oxid-oxygen anesthesia in more than 75 per cent of their operations.

Nitrous oxid is a colorless gas possessing a rather sweet taste and odor. It is obtained by heating granulated ammonium nitrate to 460° F. and collecting the gas evolved over water. In olden days the dentists made their own nitrous oxid. No doubt you are quite aware that nitrous oxid may contain undesirable impurities due to the use of poor basic nitrate, as well as an uneven temperature during manufacturing and improper washing of the gas before condensing in cylinders. Also with oxygen, the commercial product from liquid air may contain enough nitrogen to prevent anesthesia, or the oxygen may be put in cylinders that have contained other noxious gases, as hydrogen, chlorine or acetylene. Today a purer and better gas can be obtained from a manufacturer who carries out the processes necessary for a complete purification of the gas. Pure gases are essential for good anesthesia.

A good anesthetic must be soluble in the circulating medium of the body and carried in a manner similar to food and oxygen, if it is to be readily absorbed and eliminated. Green has shown that blood serum dissolves 25 per cent by volume of nitrous oxid, which is about fifteen times the solubility of nitrogen and more than one hundred times that of oxygen (0.24 per cent by volume), thus nitrous oxid is more readily soluble in serum than oxygen is in serum and hemoglobin.

This leads us to the observation, through the law of partial pressures of gases, that when nitrous oxid is administered there are so many molecules of nitrous oxid in serum that the oxygen molecules are crowded apart or diluted,

*Read before the Florida State Dental Society, Miami, Florida, on October 26, 1928.

a slowing up of chemical changes being thus effected in most susceptible brain cells, resulting in sleep, lack of coordination, etc., while other functions requiring less oxygen per minute may proceed with little, if any, interference. Nitrous oxid produces anesthesia by reason of its interference with the use of oxygen by brain cells, apparently exerting no other influence except this oxygen interference; furthermore, its total effect on the body continues but a few minutes beyond the termination of administration. Nitrous oxid does not destroy either normal or diseased tissue, as has been shown by experiments upon tubercular animals, who have been subjected to 85 per cent nitrous oxid and 15 per cent oxygen for forty-eight hours. It enters the blood as nitrous oxid, produces its anesthetic effect as nitrous oxid and is eliminated by the lungs as nitrous oxid.

To be a successful anesthetist one must recognize the signs of light anesthesia on one hand and those of deep anesthesia on the other, by closely watching the respiration, pulse, pupil, eyeball, color, muscular indications, facial expressions, etc.

Respiration in the first or analgesia stage is even and regular. In the second or excitement stage, respiration might become irregular. In the third, or surgical stage, respiration becomes more regular and possibly deeper—similar to normal sleep until after the second stratum or ideal operative stage is passed. Should anesthesia be deepened beyond this stage, the respiration is more shallow and much more rapid until the border line between the third and fourth stages is reached. At this time, respiration almost, if not entirely, ceases. In the fourth stage, respiration stops. Near approach to this stage should be avoided as dangers lie in it.

The movement of the eyeball is normal until we have reached the surgical stage of anesthesia, then we will see either the oscillating, excentrically fixed or jerky eyeball, the more exaggerated and oscillating movements being found in the earlier planes of the surgical stage. In the second plane of the surgical or operation stage the eyeball is usually excentrically fixed. This indicates the second stratum of the surgical stage, the most preferable of all stages for operation. As the anesthesia becomes more profound and the third plane of the surgical stage is reached, the eyeball assumes central position. Any enlargement of the pupil at this time is indicative of approach to deep and dangerous stages. If the depth of narcosis should reach this plane, with any type of patient we may notice a jerking of the eyeball.

In nitrous oxid anesthesia, color of the patient cannot be depended upon as a safe guide, for with the anemics we might not have marked color changes until we are in grave danger and even then some cases grow lighter, possibly due to blanching from nausea, instead of darker as would be expected. With plethorics, due to the excessive amount of oxygen in their tissues, color changes are more marked. The plethoric patient becomes cyanotic quickly and may frighten the anesthetist when no grave danger is present. Deepening color should not be disregarded, but should be taken into consideration in connection with patient's characteristics and other symptoms.

Muscular indications in the first stage of anesthesia are normal. In the second stage and first plane of third or surgical stage, the muscles may be

more or less rigid. In the second plane of the surgical stage partially relaxed; in the fourth or danger stage there is spasmodic muscular contraction and bowing of the back. It is very easy to confuse the rigidity of the second stage and the first plane of the third stage with the rigidity of the border line of the danger stage. Rigidity in the second stage or first plane of the third is due to the yet incomplete action of nitrous oxid. The muscles still have some of their normal tonicity and are somewhat stimulated by excitement. The spasmodic contraction and bowing of the back in the fourth or danger stage is due to a lack of oxygen.

The pupil in the first and second stages indicates by its reflexes that anesthesia has not reached the surgical stage. When the reflexes almost disappear and the pupil grows somewhat smaller we are entering the first stratum of surgical anesthesia. The pupil grows still smaller and reflexes entirely disappear. If we continue to anesthetize the patient more deeply, the pupil progressively dilates until in the fourth stage the iris is almost concealed by marked pupillary dilatation.

Facial expression in the first stage is normal. Second stage shows consciousness. Third or surgical stage shows normal sleep. Fourth or danger stage shows a bewildered or deathly look.

As to the methods of administering nitrous oxid and oxygen I will mention two. One is the sliding method, as advocated by Dr. Heidbrink, where 7 per cent oxygen is given in connection with the 93 per cent nitrous oxid for the first sixty seconds of induction, then straight nitrous oxid for about forty seconds. At this time the patient should be anesthetized, then 7 per cent oxygen is added to the nitrous oxid for the carrying period. Of course some patients require a greater percentage of oxygen during the carrying period. It is claimed by those who advocate this method that any considerable variation from the forty-second period for establishment of anesthesia will be an indication to the anesthetist that he has an abnormal or difficult patient to deal with and may indicate to him the degree of abnormality or difficulty. By giving oxygen for the first sixty seconds the patient does not complain of a suffocating feeling, therefore, it does away with a great deal of the struggling or fighting during the excitable stage. I personally use the sliding method in my work and find no good reason for changing.

The other method is quicker induction by pure nitrous oxid, no oxygen. Thus oxygen is rapidly eliminated from the system until the patient has reached a stage of anesthesia slightly beyond the operative stage. Then, sufficient oxygen is added to prevent deeper anesthesia, and to bring the patient back into the operative anesthesia stage, which should be maintained throughout the operation. The advocates of this method claim it to be an advantage as by carrying the patient rapidly through the excitable stage they get less restlessness or possible boisterousness, which sometimes verges upon the point of impossible control of the patient's actions. A great degree of relaxation may also be noticed in a few seconds after adding oxygen, if the patient has been deprived of it until the third stratum of the third stage has been reached. This technic is known as McKesson's Secondary Saturation.

In known difficult patients, a ¼ gr. morphine tablet dissolved under the tongue about forty-five minutes before the operation is a distinct aid. Morphine is doubtless the best premedication we have, because it is the greatest metabolic inhibitant. The average dose for men is ¼ gr.; for women ⅙ gr. to be given hypodermatically an hour before the time for anesthesia. The morphine atropine combination is preferable to morphine alone because the atropine dries up the secretions, so that there is less likelihood that mucus will get into the throat to interfere with breathing.

Some dentists and patients prefer nonnarcotic drugs. In such cases chloritone may be given. Here I wish to quote Dr. B. H. Harms, of Omaha, Nebraska, "For premedication prescribe 200 grams of orange juice to be taken the night and morning before the operation." This amount contains 20 grams of fruit sugar and 6 grams of mineral ash, while at the same time it provides a needed amount of water. The acids of the orange juice are oxidized in the body to form bicarbonate and thus exert a beneficial influence in increasing the alkaline reserve. Since Dr. Harms established this régime in his office practice he has found most remarkable improvement in the postoperative recoveries of patients, with an almost entire disappearance of postoperative nausea and depression. He also says, "With this method I have never seen any of the resistant types of patients that require a preanesthesia drug."

Gentlemen, this is something we Florida dentists should try as we have plenty of good oranges.

As to the machine one uses to administer nitrous oxid and oxygen for anesthesia, there are two essential requirements. First: That it should be constructed so at all times the anesthetist will be able to proportion his gases and know the percentage of each. Second: That either gas may be cut off at any time, thus permitting the separate administration of each. It is especially essential to be able to administer pure oxygen for an emergency.

The pulse rate should be taken and respiration noted before starting. It is essential for the operator to have everything in readiness before the patient begins to inhale the anesthetic, so that every second of the period of anesthesia may be properly utilized.

Seat the patient in a chair, the head in straight line with body (not tilted forward or back), hands in laps, feet not crossed. Now detach nose piece from the inhaler tubing and place it over nose and put mouth prop in place. Tell patient to breathe naturally through nose and to go to sleep. Now turn on the gases in the proper percentages to be used; connect nose piece up with the inhaler tubing of the machine; cover the mouth with the mouth cover and administration is begun. The nose piece and the mouth cover must fit snugly so no air will be inhaled as air would interfere with the anesthesia. When anesthesia has progressed to the desired stage for operation, a mouth pack should be placed in the back of the mouth for two purposes. First, to keep the gases from being diluted with air; second, to prevent roots, teeth or blood from being aspirated into the bronchi.

In case a patient should be overdosed or for any other reason the breathing stops, it is necessary to open the air passages and get air or oxygen into the

lungs. The tongue may be brought forward by passing the index finger of one hand backward along the side of the tongue to its root, where the finger is wrapped around the tongue at its root (just above the epiglottis) and the whole tongue carried forward. This will open the air passages. Then press the lower ribs with the other hand at breathing intervals and allow pure oxygen to be forced in through the nose piece. Do not get excited or you will forget what should be done at this moment.

In closing this paper I would state, especially for those who are beginning to use nitrous oxid, never to attempt to perform an operation with nitrous oxid anesthesia unless you feel that you can perform it just as well as you could with a local anesthetic. This will save many a man from discouragement with nitrous oxid and oxygen anesthesia.

CARBON DIOXID AS A RESPIRATORY STIMULANT*

By Edward L. Thompson, D.D.S., Daytona Beach, Fla.

FOR years we have been taught and have believed that breathing more than 4.4 per cent of carbon dioxid would cause cyanosis, exaggerated breathing and other symptoms. Now we find by experiments that have been carried on that this is not true, and that carbon dioxid in proper proportions with oxygen is a great aid in resuscitation and makes general anesthesia safer and smoother.

Henderson, Haggard and others, have established the fact that oxygen in itself does not maintain respiration and that carbon dioxid is the normal stimulant which regulates breathing.

Dr. Chipman states he has used carbon dioxid 25 per cent and oxygen 75 per cent for induction, in place of nitrous oxid and oxygen, then switches to ether. The results are that his patients are quietly anesthetized, with a good pink color showing that they are really superoxygenated.

Carbon dioxid and oxygen are used in checking hiccoughs with good results; also in carbon monoxid poisoning and in the sobering up process of acute alcoholic cases and in treating pneumonia.

Dr. Lundy says he uses 5 per cent carbon dioxid and 95 per cent oxygen for resuscitation of newborn infants and finds by using carbon dioxid with oxygen and nitrous oxid that the combination of the gases produce an ideal anesthesia, especially in children.

Dr. H. B. Clark, of St. Paul, an exodontist, has been using nitrous oxid, oxygen and carbon dioxid combination for over two years with very pleasing results. Dr. J. A. Heidbrink is using the same combination.

By using carbon dioxid, nitrous oxid and oxygen combination a great degree of relaxation is obtained without the use of ether. Most difficult patients are carried through the excitable stage without any difficulty. The gases used

*Read before the Florida State Anesthetist Society, Miami, Fla., on October 24, 1928.

are exhaled quicker after the operation and nausea is controlled to a great extent. These things are accomplished by the stimulation of the respiratory centers by CO_2.

If an accident of over-etherizing a patient occurs by giving the patient about twelve breaths of CO_2 10 per cent and oxygen 90 per cent the patient is soon restored to normal breathing.

Dr. Reghetti concludes as follows regarding the advantages of carbon dioxide in her experience as an anesthetist.

1. De-etherization with CO_2 is simple and effective.

2. It is probably an important agent in preventing postoperative pneumonia.

3. An emergency tank of CO_2 in an operating room is of more value than the usual oxygen emergency tank. Dr. J. S. Lundy comments favorably as a result of his experiences with carbon dioxid as an adjunct to general anesthesia. His conclusions are:

1. Carbon dioxid in moderate concentrations assists in producing anesthesia, rendering the anesthetic apparently safer and easier to administer.

2. Carbon dioxid should be used in such concentrations as will produce optional results and these vary with the individual and the type and stage of the operation. Too much CO_2 is worse than none and care should be exercised to prevent more than 5 per cent being used.

3. The results thus far in a series of 1350 cases in the Mayo Clinics are satisfactory enough to warrant further investigation by others in the use of CO_2 during the induction and maintenance and termination of ordinary general anesthesia.

I believe the use of three to five gallons of carbon dioxid per hour with nitrous oxid and oxygen at the same rates of percentage as we are accustomed to using, will anesthetize our patients with little or no cyanosis and less muscular tension. With the special attachment for CO_2 as I have on my machine to get a 3 per cent proportion of CO_2, you open valve to where five gallons per hour registers on the gauge; to get a 5 per cent proportion, you open valve to where ten gallons per hour registers on the gauge. Three per cent is the safest and best proportion to use. Now if the patient shows an over-vigorous movement of the chest wall, discontinue the CO_2.

DEPARTMENT OF
DENTAL AND ORAL RADIOGRAPHY

Edited By
Clarence O. Simpson, M.D., D.D.S., F.A.C.D.,
and Howard R. Raper, D.D.S., F.A.C.D.

A PROCEDURE FOR OBTAINING RADIOGRAPHIC IMAGES OF THE FACIAL PROFILE IN THE SAGITTAL PLANE

By Clarence O. Simpson, M.D., D.D.S., St. Louis, Mo.

OF THE various methods which have been used to register the facial profile, radiography offers the only means of disclosing the relation of the soft tissues to the teeth and bones. The technical problem involved in the process is to obtain distinct images of tissues greatly differing in radiability. Although the x-rays can reveal the structure of a delicate flower or a steel beam, the quality and intensity of the radiation, and to some degree the recording medium must be suitable for the purpose employed. In the human hand the bones and flesh may be radiographically registered together rather easily, but when the maxillae are radiographed to show structural detail and the roots of the teeth, the soft tissues of the face are barely perceptible. When the facial profile is produced as a sharp silhouette, the teeth and bones are not visible. To disclose the outline of the bones and teeth without sacrificing the image of the soft tissues requires an appropriate balance of the factors concerned.

The first essential to be considered in obtaining an image of the facial profile for study is perspective. If the relation of the anatomic landmarks, or localizing indicators, is distorted, the image will be misleading and worthless for critical study. A lens with a short focal distance for photography, or a short target-film distance for radiography, produces distorted images proportional to the extent of the field from the lens axis or central rays. If the lens axis in photography, or the central rays in radiography, pass through the tragia, the tragion-orbitale and the tragion-gnathion dimensions will be elongated. If the axis or central rays pass through the orbitalia, the orbitale-tragion and the orbitale-gnathion dimensions will be elongated. The distortion may be partially equalized by centering at a neutral point approximately corresponding to the crown of the maxillary first molar, but a more accurate method is to improve the perspective by the use of a lens of longer focal distance or a longer target-film distance.

Theoretically, the improvement in perspective continues to infinity, but with a field the size of the human head it is most evident in the first 10 feet. Since the exposure time increases with the focal length of lenses and the target-film distance in radiography, a practicable compromise must be accepted. In photography, a lens of a focal length equaling the sum of the dimensions of the length and width of the film is considered sufficient for

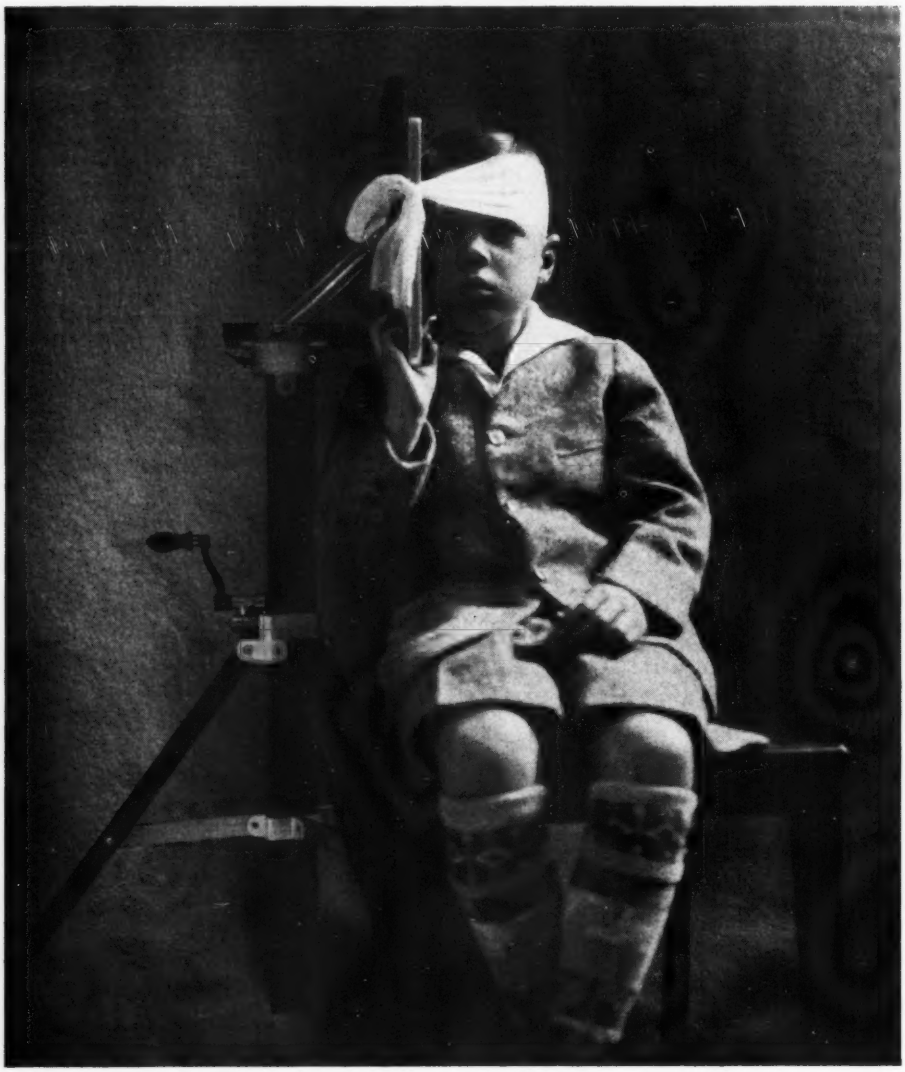

Fig. 1.—The use of a clinical camera stand as a head support where the location of the operating chair is inconvenient for distant exposures.

general purposes although a longer focus is preferable for portraits. Since an 8x10 film is required for a face of life size, at least a focal length of 18 inches and exposure distance of about 5 feet are indicated.

In radiography because of the film being about 3 inches from the median profile, the image is obviously distorted at a short target-film distance, and is not projected approximately true at a distance less than 6 feet. Even with a 45 kilovolt or 3 inch machine a distance of 6 feet does not require exces-

sively long exposures if an intensifying screen is used. To obtain the perspective advantage of this distance with apparatus of restricted capacity, it is expedient to utilize the features subsequently described.

A cassette is better than a cardboard container for the film because it it easier loaded and unloaded, it is more rigid, the weight adds stability when adequately supported, and it supplies even contact with an intensifying screen. Any properly constructed cassette may be used, but the type recently produced by the Buck X-Ograph Company is especially suitable. The advantages of the Buck cassette are that it has two spring catches on the 8x10 size which insure screen contact, and the front is bakelite which absorbs about one-half as much radiation as the usual aluminum front. The metal binding around the bakelite front which outlines the extent of the film is a convenience in appropriately posing the subject on the cassette.

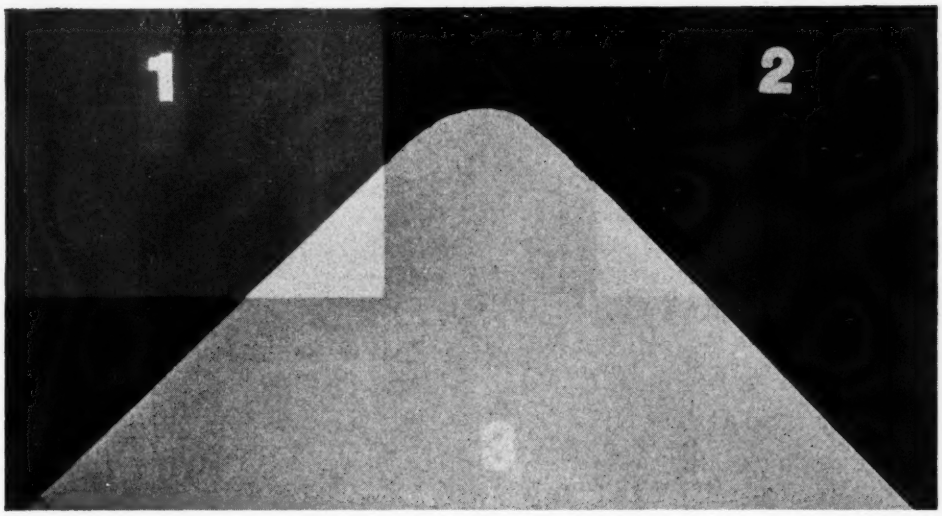

Fig. 2.—An illustration of the difference in radiability of (1) aluminum 0.8 mm. thick, (2) bakelite 3 mm. thick, which are used for the front of 8x10 cassettes, and (3) a thin intensifying screen. This demonstrates that aluminum cassettes absorb about twice as much radiation as bakelite cassettes, and an intensifying screen absorbs as much as 2 mm. of aluminum.

Intensifying screens, by increasing the actinic or chemical action of the radiation, materially reduce the exposure required to produce an image of the desired density. Only by the aid of intensifying screens can radiographs be made at a long distance without excessively long exposures. In radiographing the facial profile, the gain in perspective by distance more than compensates for the increased contrast between the hard and soft tissues produced by intensifying screens. However, for this purpose a modification is indicated in the screen feature. The use of two intensifying screens exaggerates the contrast, and the front screen absorbs a great amount of weak radiation which is needed for the image of the soft tissues. By using only one screen placed behind the film, the contrast is modified and the soft tissues are more clearly registered. The French screens, because of their speed, are particularly suitable for distance technic.

By chemical reduction, the density of overexposed or overdeveloped radiographic negatives may be diminished, or the detail in denser portions may

be disclosed without affecting the remainder of the image. Local reduction is indicated for the films of intraoral examinations because of the difference in radiability of the areas in each region, and in profile radiographs to disclose more detail of the soft tissues. By inclining the film so the action of the solution is confined to the image of the soft tissues, the density in other portions will be unchanged. When only one screen is used, the chemical reduction should be limited to the screen side of the film upon which the image is denser. The following formula is excellent for chemical reduction:

Stock Solution A	
Water	16 oz.
Sodium Cyanide	65 gr.
Stock Solution B	
Water	1 oz.
Potassium Iodide	80 gr.
Metallic Iodine	40 gr.
Reducing Solution	
Solution A	1 oz.
Solution B	30 mm.

The reducing may be done at any time after the films are fixed, but dry films should be placed in water for a few minutes to obtain an even application of the reducing solution. The toxic properties of sodium cyanide demand precautions in the use of the solution, but it does not affect the skin unless there is a sensitization to iodine.

The image of the soft tissues can be accentuated by applying bismuth ointment to the face before the radiographic exposure. This is indicated more for the nose, and especially in the nasion and subnasion regions where the soft tissues are thin. The ointment should be thoroughly spread in a thin application to avoid an excess at any location, and it may readily be removed with no other than a beneficial effect to the skin.

If the operating chair is conveniently located, it may be advantageously used for the examination. By lowering or removing one of the chair arms, the patient can turn with the feet at the side of the chair and rest the cassette on the shoulder and against the head rest. If the location of the operating chair does not permit the desired distance, a clinical camera stand which most orthodontists have, may be used with an ordinary chair. With either arrangement, the cassette should be firmly supported and the patient's head tightly bound to the cassette and head support with a strip of gauze, to promote immobility during the exposure. To raise the lower border of the cassette to the desired level, and to make it more comfortable to the shoulder a folded towel should be placed under it. The patient's head should be carefully posed to have the sagittal or median plane parallel with the cassette. This may be done by standing directly in front of the patient and viewing the face in relation to the cassette, and also looking downward at the relation of the nose

and cassette. Just before the exposure is begun, the patient should be instructed to bring the teeth into centric occlusion, relax the lips, and not to move during the exposure. The operator should observe that the directions regarding the occlusion are followed, and with young patients it is advisable during the exposure to repeat the command to hold still.

The x-ray tube should be at the level of the patient's face, and the central rays directed as nearly as possible at the maxillary first molar crown and perpendicular to the cassette. If there is a detachable filter or opaque cone in front of the tube, it should be removed to utilize all of the soft radiation, and when the illumination in the room is subdued, the filament light re-

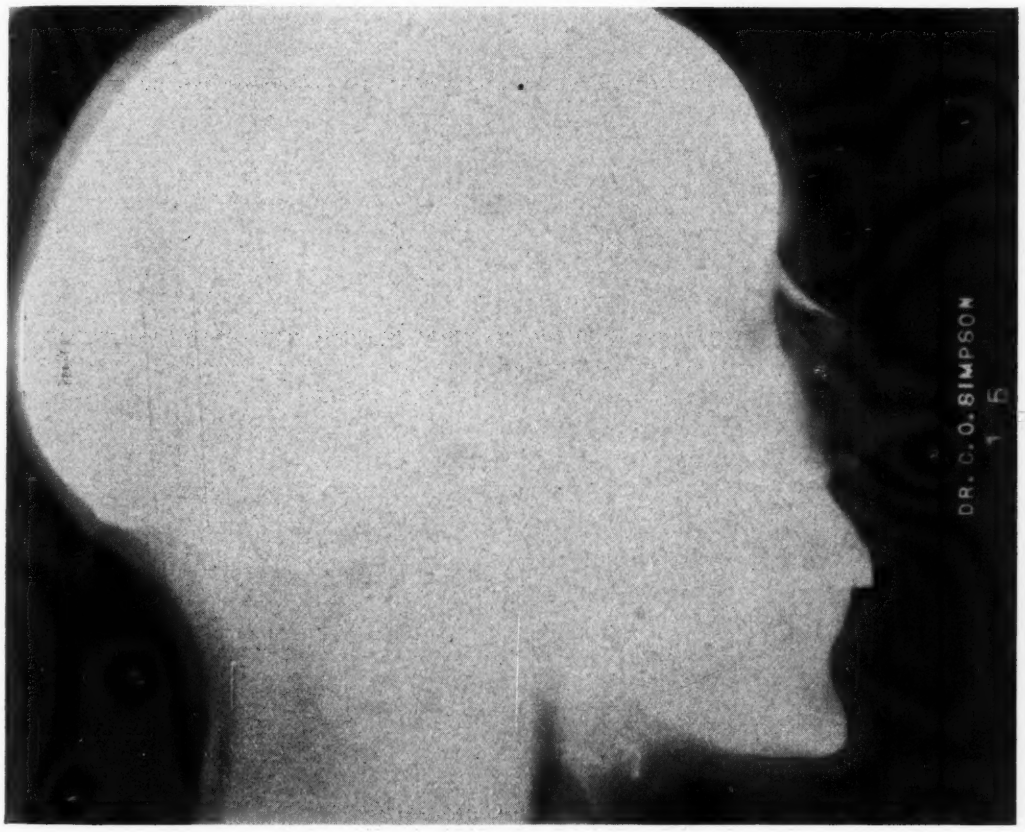

Fig. 3.—A radiographic image of a facial profile made at a distance of 15 feet, which is desirable for perspective.

flected from the target of the tube will project a shadow of the profile on the cassette to aid in symmetrically locating the image on the film. It is desirable to include the occiput on the film, and to accomplish this careful posing is required.

The modifications recommended for the various features of the examination may at first seem intricate, but after the systematic procedure is adopted it should facilitate the obtaining of a reliable record. As a convenient operative guide, the following summary is proposed as a definite technic.

Technic with 45 Kilovolts, and 10 Milliamperes. (The Small Dental Unit)

Load an 8x10 cassette, preferably one having a bakelite front, with duplitized film and a fast intensifying screen behind it.

Apply a thin layer of bismuth ointment to the patient's nose, especially over the nasion and subnasion.

Seat the patient with the feet at the side of the operating chair, or on an ordinary chair beside a clinical camera stand.

Rest the cassette on the patient's shoulder, and against the head rest or the raised platform of the camera stand.

Fig. 4.—A radiographic image of the same facial profile as Fig. 3 made at a distance of 6 feet, with 45 kilovolts, ten milliamperes, and an exposure of six seconds. The enlargement of the image over that made at 15 feet amounts to 4½ mm. from the occipital protuberance to the incisors, and 2½ mm. from the nasion to the gnathion.

Place the tube at the level of the maxillary teeth with the target 6 (measured) feet from the cassette, and the central rays directed perpendicular to the cassette.

Pose the patient's head symmetrically on the cassette, with the sagittal plane vertical and parallel with the cassette.

Tightly bind the patient's head to the cassette and head rest with a strip of 3 inch gauze.

Have the patient place the teeth in centric occlusion, and relax the lips.

Instruct the patient to not move, and repeat as a command during the exposure.

Expose for six seconds.

Develop the film full time.

Chemically reduce the image of the soft tissues on the screen side of the film.

With more powerful apparatus and a 30 milliampere tube, conform to all the details of the technic with the following exceptions: Increase the target-film distance to fifteen feet. Use 70 kilovolts, and 40 milliamperes, which is permissible for short exposures. Expose for five seconds. If the range of the office is not sufficient for this distance, or the patient is intractable, expose at a distance of 10 feet for two and one-half seconds.

ABSTRACT OF
CURRENT LITERATURE

ORTHODONTIA — ORAL SURGERY — SURGICAL ORTHODONTIA
DENTAL RADIOGRAPHY
By Dr. Edward Preble, New York City

NUTRITION AND PEDIATRICS
By Dr. Samuel Adams Cohen, New York City

It is the purpose of this Journal to review so far as possible the most important literature as it appears in English and Foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

Nutrition and Pediatrics

Actinotherapy at the Finsen Institute, Copenhagen. Axel Reyn, Brit. Jour. Tuber., January, 1928, xxii, 1.

Reyn emphasizes the importance of individuals, particularly children in whom the existence of tuberculosis be suspected, going to the country where they will have a chance to get sun-baths. If this is impracticable, they should be treated with light baths, and the author prefers carbon arc light baths.

Union International Bulletin of Tuberculosis, April, 1928, v, 2.

The bulletin reports on the progress made in combating tuberculosis in many nations. In Sweden, for example, Dr. Gustof Neander gives an account of an extremely instructive experiment carried out in a district in the North of Sweden where tuberculosis is widespread.

Since 1905, a successful campaign was waged to enlighten the inhabitants there how to conquer the scourge which was so prevalent. In this campaign of education the most difficult task of all was to protect the children who were exposed to tuberculosis at home from becoming infected.

In Brazil, Dr. Placida Barbosa reports of the activities of the section of tuberculosis in the National Public Health Department. He writes that popular education in hygienic measures for prevention of tuberculosis is gradually taking root.

In Bulgaria, Dr. R. Radkoff explains that tuberculosis ranks as the first cause of death; eighteen out of every hundred deaths were caused by this disease. Measures are gradually being adopted by the government to reduce the incidence of tuberculosis. A decided step in a forward direction was the establishment of a crèche for children at Sofia for the separation of children born of tuberculous mothers.

The Canadian Tuberculosis Association in their interesting and enlightening report of 1926 tell of their study of the Indian and tuberculosis.

The conclusions of this survey are that the incidence of tuberculosis is much greater than that which is found in the average white population, also

that the disease appears at a much earlier age, and when it becomes well established it progresses to a more uniformly fatal result. In their study of the Indians in Qu'Appelle Valley it was found on the whole the incidence of tuberculosis was greater there than that of the white children. Nevertheless, there is evidence clinically to show that their tubercular disease is of such a character as to show marked advance in resistance against the disease.

In Italy there is a decline in the death rate from abdominal tuberculosis, and from tuberculosis of the bones and glands.

In Latvia, measures were first taken by the State in 1923 to wage a campaign against tuberculosis. The city of Riga, for instance, pays for pauper patients treated in the city's institutions, and it also has a medical inspection of the school children every year.

From Norway, Professor Frölich presents some interesting data. In 1912 he started a program of Pirquet examinations supplemented by a careful clinical examination. Of 1830 children found at that time to be already infected 223 or 12.2 per cent developed tuberculosis in some form. Seventy-nine of these 1830 children had died; tuberculosis being the cause in twice as many cases as those from all other cases put together.

It is interesting to note that deaths from tuberculosis were practically twice as numerous among the girls as among the boys.

Among the conclusions drawn by Frölich is that amongst Pirquet-positive children those who are exposed to infection in the family develop tuberculosis twice as often as those who become Pirquet-positive as a result of infection outside of the family, and the death-rate from tuberculosis is nearly four times greater in the former than in the latter class.

The Pathology of Pulmonary and Bronchial Gland Tuberculosis in Infancy and Childhood. P. F. Armand-Delille and Ch. Lestocquoy. Tubercle, May, 1928, ix, 8.

Speaking of prophylaxis and treatment of tuberculosis, these French writers state that the best means of all is the prevention of the evolution of the tubercle by good medicosocial work. They approve of the use of Calmette vaccination in the earliest stages of life, or later on the use of Granger's method of removing the children from contact with tuberculosis and placing them in healthy families in the country.

Ivestigation of the Pirquet and Wassermann Reaction on Asthmatic Children. Kaj H. Baagöe. Brit. Jour. Child. Dis., April to June, 1928, xxv, 292-294.

Baagöe's investigation, from the Children's Department of Rigshopitalet, Copenhagen, does not support the view that syphilis plays any part in the development of asthma. He does, however, confirm the findings made by Wallegren that a positive tuberculin reaction does not occur any more frequently in children with asthma than in other children with no active tuberculosis. He also feels that there is no actiologic connection between hypersensitiveness to tuberculin and asthma.

Vaccination of the Newborn Against Tuberculosis with BCG. A. Calmette-C. Gérin; A. Boguet and L. Nègre. Ann. de l'Inst. Pasteur, January, 1928, xlii, 1.

Reporting from the Pasteur Institute in France these authors state that reports show that from 26 to 80 per cent of children who were repeatedly exposed to tuberculosis die during the first year, presumably from tuberculosis.

From July 1, 1924, to December 1, 1927, 52,772 infants were vaccinated with BCG, and of these 6,219 were occasionally exposed to tuberculosis or were born of tuberculous mothers. These statistics show that the deaths from tuberculosis were 0.9 per hundred as compared with 24 per cent to 80 per cent among unvaccinated infants.

Calmette and his collaborators state that there are no ill effects as a result of injection with this vaccine.

The Viability of the Tubercle Bacillus Under Zero Conditions Outside the Body. S. Roodhouse Gloyna. Tubercle, September, 1928, ix, 12.

Gloyne quotes Cornet who stated that bacilli survived in sputum for about six months. As a result of his own investigation with a human strain of tubercle bacillus of known virulence kept as near zero as possible, the author found that the tubercle bacillus, even after twelve weeks' duration in this state, was able to produce generalized tuberculosis in guinea pigs.

Diet in Tuberculosis. Ashutosh Roy. Indian Medical Record, July, 1928, xlviii, 7.

Roy in discussing the metabolism in tuberculosis states that the increased consumption of oxygen explains the benefit of open air treatment. The increased oxidation creates a demand for a greater quantity of food.

In patients suffering from tuberculosis the author advocates an excess of quantity of food over normal in health, but admonishes against forced feedings with enormous quantities of food. He feels that the digestive apparatus should not be taxed beyond the degree of safety.

Roy quotes Fisher who states that diets should be individualized and Mackenzie who states that a gain in weight is not always a sign of improvement in other directions.

Orthodontia, Oral Surgery and Radiography

Replantation of Teeth. E. V. Schlottman, Philadelphia. The Penn Dental Journal, November, 1928.

Replantation is naturally concerned only with the planting of extracted teeth in their original sockets. This differs from the other forms of plantation in one respect, that there are abundant opportunities for testing it, for sound teeth are often knocked out and are sometimes pulled by mistake. Of recent years the question of replanting teeth in diseased conditions, such as apical infections, has come to the front and Dr. Kells regarded it as a possible sub-

stitute for apicectomy. Originally replanting was thought to require immediate performance in the belief that the tooth must be living—at least as far as its periodontal membrane is concerned. This is now known to be based on error; so much so in fact that in 1921 Tompkins reported cases of successful implantation of porcelain dummy teeth. At the present day reimplantation is believed to be done under the most favorable conditions if there is a delay of three days to a week. This advantage is due to certain changes which take place in the alveolus, the latter containing many active living cells. Opinion as to the length of the fixation period varies extremely—from three weeks to eight months, according to the operator and the choice of method. The presence of the periosteum of the root is of no advantage or disadvantage. We still know very little of the method of attachment which Nature practices, having only a few animal experiments as foundation. More or less absorption of the root takes place but it does not appear that this is often followed by loosening. Cases cited show that replanted teeth have persisted in their sockets for many years—sixteen and twenty-seven for example.

Are There Any Female Bleeders? Hans Hirschfeld, Berlin. Zahnaerztliche Rundschau, November 11, 1928.

According to reference works there are no female hemophiliacs, for in this hereditary affection the disease is transmitted only by the male members. Nevertheless cases are now and then reported in which women have bled very freely in the dentist's office and recently Dr. Lewinski reported an additional case in the Rundschau. Hirschfeld, who has studied these reports critically, decides that not one of these women was a true bleeder. In order to uphold such a diagnosis the following points must be definitely established: There must have been a tendency to bleed from the earliest times and under all circumstances in which hemorrhages are apt to occur. Second, there should be the familial incidence, although it is admitted that in rare instances no other family members show the tendency. Third, blood tests must show that the coagulation time of the blood is actually longer than the average by a considerable extent, although in other respects the blood should be normal. In the case reported by Lewinski there was no blood test made, nor are there any data given to indicate that the patient had ever showed a hemorrhagic tendency before. The question now arises, why do these women sometimes bleed? In the author's opinion they have a blood disease although it has nothing in common with true hemophilia. The coagulation time is normal and there is a large number of blood platelets, a condition not encountered in hemophilia. The disease, in the author's opinion, is a form of Werlnoff's disease, sometimes known as land scurvy, which is seen in acute expressions as purpura and other local hemorrhages. Hemorrhage here is annoying and persistent but hardly of the type seen in true hemophilia.

Should a Dentist Charge for Advice? Editorial in the Dental Surgeon, November 10, 1928.

The editor states his opinion that as much publicity as possible should be given to a recent court case in which a dentist practicing in the West End of

London sued the husband of a patient for the sum of one guinea, the service having been limited to an examination and opinion. An appointment had been duly made. The opinion had to do with the correctness of advice given by another dentist, the nature of the work required and the cost of the same. The patient did not return and a bill was sent charging a fee for "consultation." No notice was taken of several of these statements until finally the husband declined in writing to pay the bill because no service had been rendered. The matter was next turned over to a solicitor and in the end a summons was served on the husband and the dentist obtained judgment for the amount of the bill with costs, the court sustaining the claim that a professional fee was for skilled advice and not to be compared with a tradesman's estimate. The dentist was entitled to a fee in any case for the use of his time. The case is of historical importance although the decision which made the finding of the court possible goes back to 1878 and seems to imply that a registered dentist is naturally entitled to fees for advice. In the original case the dentist who had brought the suit was not registered and lost his claim. The editor counsels the profession to make the best of this recent decision and as far as possible refrain from giving advice without compensation.

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EDITORIALS

Licensing Specialists

A PROPOSED law to license orthodontists in the State of California was published in a recent issue of the INTERNATIONAL JOURNAL OF ORTHODONTIA, ORAL SURGERY AND RADIOGRAPHY. The purpose of the proposed law of California seems to be first to legalize the practice of orthodontia so as to make it separate and distinct from dentistry, and second to establish and make compulsory a certain plan of education for all who desire to practice orthodontia in California.

The party most interested in orthodontia, the patient, was not considered. The first object of any plan to establish the standing of a man in any specialty should be for the protection of the public. We find medical specialists have already taken steps along these lines.

Everyone is more or less familiar with the American College of Surgeons and the American College of Physicians. The practical object of both groups was to establish a standard for men practicing these branches of medicine. We find the specialty of otolaryngology has established a board known as the American Board of Otolaryngology; the object of which is to examine men who wish to specialize in that branch of medicine. At a recent examination held in New York City on October 11, out of one hundred thirty applicants one hundred thirteen passed. On October 15, an examination was held in St. Louis in which sixty-eight of the seventy-nine applicants passed. A similar examination will be held in Portland, Oregon, July 8, 1929.

The Journal of the American Medical Association of November 24, contains a notice referring to an American Board of Obstetrics and Gynecology. The resolution was passed by the American Society of Obstetricians, Gynecologists and Abdominal Surgeons. We are publishing the resolution and plan of organization in full because we believe it contains many points which can be very satisfactorily employed in the examination of men engaged in the practice of orthodontics.

PLAN OF ORGANIZATION

Board of Directors and Examiners.—The Board of Directors and Examiners shall be nine in number, representing the nine different sections of the United States and Canada.

Three to be appointed for five years by the American Association of Obstetricians, Gynecologists and Abdominal Surgeons.

Three to be appointed for five years by the Section on Obstetrics, Gynecology and Abdominal Surgery of the American Medical Association.

There shall be at least one assistant examiner in each district nominated by the examiner in each district, subject to the approval of the board.

The examination of each candidate shall be conducted by three examiners.

Officers.—The Board of directors shall elect from their number a president, a vice-president, and a secretary and treasurer.

Purposes. 1. To evaluate the standard and perform such functions as will advance the cause of obstetrics and gynecology.

2. To determine the competence of specialists in obstetrics and gynecology.

3. To arrange, control and conduct investigations and examinations to test the qualifications of voluntary candidates for a certificate to be conferred by the board.

4. To serve the public, hospitals and medical schools by preparing lists of practitioners who have been certified by the board.

5. To protect the public against irresponsible and unqualified practitioners who profess to be specialists in obstetrics and gynecology.

General Requirements for All Applicants.—1. High ethical and professional standing.

2. A medical degree satisfactory to the board.

3. Adequate training in obstetrics or gynecology as a specialty.

4. Formal application on an official application blank, which shall include the candidate's professional record.

5. Enclosure of a small photograph and three reprints of each published medical paper with the application blank.

6. A fee of $25 with each application.

7. Two letters of endorsement from well-known obstetricians and gynecologists.

Classification of Applicants.—Applicants to be eligible for certificates shall be grouped as:

Group 1. Those whose present professional record and prestige are such as to give them preeminence in obstetrics and gynecology.

Group 2. Those who have specialized in obstetrics or gynecology for ten years or more.

Group 3. Those who have specialized in obstetrics or gynecology for more than five and less than ten years.

Special Requirements for the Various Groups. 1. May be passed on their records without further examinations, after filling out the application blank and paying the fee of $25.00.

Group 2. Practical clinical and laboratory examination, including gynecologic and obstetric pathology.

Group 3. Written reports of fifty complicated obstetric or pelvic surgical cases, with a practical and written clinical and laboratory examination.

Examinations shall be given in obstetrics and gynecology.

Before becoming eligible for examination, each applicant must present himself personally to one member of the board who will go over his credentials and make a survey of his character.

The examiners shall endeavor to be fair-minded, avoiding an unduly exacting standard on the one hand, and an unwarranted laxity on the other, either of which would defeat the purpose of the investigation.

The certificate of the board shall be issued to each applicant who passes his examination successfully.

In the event of failure to pass the examination, the application fee shall not be returnable, but the candidate may be admitted to a second examination after one year or within three years without additional fee. If he reapplies after three years he will be required to make a new application and pay another fee of $25.

The conferring of degrees is not contemplated by this board, as this is a function for universities, and the board shall not attempt to control the practice of obstetrics and gynecology by the promotion of any license or legal regulations.

It is hoped that all well-established specialists in obstetrics or gynecology will apply for the certificate of the board, thereby indicating their approval of the movement to elevate the standards of training in obstetrics and gynecology.

Zahnärztliche Röntgenologie und Klinische Zahnheilkunde im Röntgenbild*

ALTHOUGH this edition of the work was published in 1926, the exhaustive compilation and original contribution of the author make it a book of practical application today.

He has gathered together, and given liberal credit to every new device and suggestion that dental roentgenography had developed up to that time.

The early chapters discuss the theory of the production of the x-ray together with a presentation of various types of manufacture that embody these principles.

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*By Dr. Med. A. Cieszynski ord professor der stomatologie an der Johann Casimir Universitat zu Livov (Polen). Zweite Vollständing Umgearbeitete Auflage mit 643 Abbildungen im Text, 7 Schwarzen und 2 Farbigen Tafeln. Leipzig Verlag von Johann Ambrosius Barth. 1926.

The profuseness of illustrations, while it has much to commend it has the obvious drawback of describing obsolete apparatus.

The reproduction of x-ray pictures back to the original negative in most cases throughout the book is somewhat disappointing, requiring very often a schematic tracing to accompany it for clarity in interpretation. For an authoritative book on how to take x-rays its results are a little discouraging.

Perhaps the fault of this may be laid to the failure of the press to reproduce the original pictures properly, but it does not excuse the defacing practice of marking a negative in ink to emphasize the point being described.

The clinical section of the book reviews the literature and presents some experiences of the author. Its illustrations are more complete and liberal in its description of the x-ray as an aid to oral surgery than the meager reference and illustrations as an adjunct to orthodontic practice.

The aim of the work is to gather from various fields such materials as would contribute to consideration of x-ray from a practical point of view.—*S. R.*

Index to Dental Literature*

THE Index to Dental Literature issued by the Dental Index Bureau covering a period of 1921 to 1923 is ready for delivery. This volume covers a period of three years made necessary by the vast amount of dental literature which was published during that time.

The Index to Dental Literature needs no introduction. It is a monumental piece of work which has been made possible by the American Dental Association, American Institute of Dental Teachers, Association of American Dental Colleges, British Dental Association, Canadian Dental Association, New Zealand Dental Association, Society of Dental Science of New South Wales, aided by contributions from individual men in the profession.

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*The Index can be obtained from the Secretary of the Dental Index Bureau, 381 Linwood Avenue, Buffalo, N. Y.

ORTHODONTIC NEWS AND NOTES

American Society of Orthodontists

The annual meeting of the American Society of Orthodontists will be held in Estes Park, Colorado, from Monday evening July 15 to Friday afternoon July 19, 1929. Hotels: Stanley (headquarters), The Crags, Lewiston and Elkhorn Lodge. All ethical dentists are invited. A registration fee of $10.00 will be charged non-members.

For hotel information write Dr. Fred W. Beesley, Republic Building, Denver, Colorado. Regarding transportation, write Dr. Kirman E. Taylor, Mack Bldg., Denver, Colorado.

Albert H. Ketcham, President,
Charles R. Baker, Secretary,
708 Church Street, Evanston, Ill.

Great Lakes Association of Orthodontists

The next meeting of the Great Lakes Association of Orthodontists will be held at the Book-Cadillac Hotel, Detroit, Wednesday March 13, 1929. An afternoon and evening session has been arranged. All members of the Dental and Medical professions are cordially invited to attend.

E. N. Bach, Secretary,
Toledo, Ohio.

Southern Society of Orthodontists

The annual meeting of the Southern Society of Orthodontists will be held at Macon, Georgia, January 31, February 1 and 2, 1929. A cordial invitation is extended to members of the profession.—W. B. Childs, President, Macon, Georgia; Dr. Oren A. Oliver, Secretary, 1101 Medical Arts Bldg., Nashville, Tenn.

American Dental Association

The Seventy-first Annual Session of the American Dental Association will be held in Washington, D. C., October 7, 8, 9, 10, and 11, 1929.

Harry B. Pinney, Secretary,
58 East Washington Street,
Chicago, Illinois.

Dental Society of the State of New York

The Dental Society of the State of New York will hold its sixty-first annual meeting at Rochester, New York, on May 15, 16, and 17, 1929.

For information with reference to exhibits, write to E. G. Link, 226 Cutler Building, Rochester, New York; Clinics, John T. McIntee, Chairman, Cutler Building, Rochester, New York; Literary Exercises, etc., A. P. Burkhart, Secretary, 57 East Genesee Street, Auburn, New York.

The Dallas Mid-Winter Dental Clinic

The Dallas Mid-Winter Dental Clinic will be held February 11, 12, 13, 1929, in Dallas. The clinicians for this meeting are Dr. T. W. Maves, of Cleveland, Oral Surgery; Dr. James W. Crawford, of Milwaukee, Prosthetics; Dr. Menifee R. Howard, of Denver, Surgery; also a man of national repute in Orthodontia yet to be selected.

Notes of Interest

Dr. A. C. Mogler announces that after January 1, 1929, his practice will be limited to orthodontia exclusively. Office, 4482 Washington Blvd., St. Louis, Mo.

Dr. Norman L. Hillyer announces that after January 1, 1929, he will be located at the office of Dr. Francis P. Hamlet, Professional Building, Hempstead, New York. Practice limited to orthodontia. Brooklyn office, 142 Joralemon Street.